MARK SCHEME for the May/June 2011 question paper

for the guidance of teachers

9693 MARINE SCIENCE

9693/04 Paper 4 (A2 Data Handling/Free Response), maximum raw mark 50

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes must be read in conjunction with the question papers and the report on the examination.

- Cambridge will not enter into discussions or correspondence in connection with these mark schemes.

Cambridge is publishing the mark schemes for the May/June 2011 question papers for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.

1 (a) 1200; [1]

(b) Axes correct and labelled;
All points plotted correctly;
Line or curve of best fit drawn; [3]

(c) (i) Downward trend / decreasing catch overall;
Ref to oscillation;
Ref to levelling off after a decline; [2 max]

(ii) When CPUE is high / increasing:
better fishing technology (or eq);
high fish stocks; regulation of fishing;

When CPUE is low / decreasing:
overfishing / depleted fish stocks;
overfishing of juveniles (or eq);
failure of fish to breed / fishing rate > replacement / breeding rate; [3 max]

(d) Illegal fishing;
Dumping of catch;
Mis-weighing;
Lost fish; [1 max]

(e) Reproduction / recruitment rates;
Growth rates;
Natural mortality rate;
Reproductive maturity age;
Fecundity (or eq);
Habitat dependency (or eq);
Time / season of spawning; [2 max]

[Total: 12]

2 (a) 1.89 / 1.9; [1]

(b) 11.03 – 6.33;
43 %;
(2 marks for 43 %) [2]

(c) High surface area to volume ratio;
(when) oxygen consumption is high;
Faster swimming / more active;
(more) respiration;
For muscle contraction;
Juvenile gills grow more slowly than the rest of the body (or eq);
Juvenile has high oxygen demand for (rapid) growth; [4 max]

(d) Mass is variable; [1]

[Total: 8]

3 (a) (i) Industrial application of biological processes [1]

(ii) Transfer of gene(s) from one species to another [1]

(iii) Breeding of strains for specific characteristics (or appropriate example) / choosing parents for particular characteristics [1]

(b) Salmon / Carp / Tilapia;
Growth promoting gene;
Ref to promoter;
Placed into fertilised eggs;
Ref to use of restriction enzymes;
Ref to use of vector / plasmid;
Gene switched on all year (or eq);
Faster growing fish;
Higher productivity;
More profit; [6 max]

(c) (i) Identify and minimise risks to the environment / public (or eq); [1]

(ii) Prevent escape;
Interbreeding to make hybrids;
(out) competing other species;
For food;
Lack of predators;
Unrestricted population growth;
Overconsumption of prey / plants;
Harm to food chains / webs;
Leading to extinction of "wild" species; [5 max]

[Total: 15]

4 **(a)** Temperature data from meteorological surveys (or eq);
Mean global temperature risen recently;
Ice cap loss;
Satellite images (showing ice cap loss);
Fossil data;
Glacial data;
Sea level rises;
Species range changes; [4 max]

(b) Ice cap melting;
Flooding / sea level rise;
Weather pattern changes;
Increased desertification / water evaporation;
Increased phytoplanktonic blooms / increased plant productivity;
Loss of species / extinctions;
Loss of food sources/ prey / grazing;
Coral bleaching;
Loss of zooxanthellae;
Water acidification;
Water oxygen depletion;
Changing water current patterns;
Change in salinity; [4 max]

(c) For human effect:
Global temperature rise over last century (or eq) linked to CO_2 rise;
CO_2 released by fossil fuel burning;
Increased number of cars / power stations (or eq);
Loss of agricultural land as a carbon sink;
Deforestation;
CH_4 due to rice / cattle farming;
Land fill / rubbish tips;
CFCs (in context) from aerosol / refrigerants;

Against human effect:
Temperature rise may be natural / cyclical;
Data from ice cores / geological data;
CO_2 from volcanoes;
CO_2 from forest fires;
Temperature rise may link to solar activity;
CO_2 increase may be due to release from warming seas;

(max 5 marks for human effect; max 4 marks against human effect) [7 max]

[Total: 15]