**1.** D

[1]

**2.** (a) (i) oxygen concentration falls as temperature rises / negative correlation/  
inverse relationship;  
steady decline below 4.2/4.3/4.4°C / *vice versa*:  
rapid decrease between 4.2/4.3/4.4°C and 5°C;  
zero oxygen concentration at/above 9 °C; 2 max

(ii) warmer water can hold less oxygen / lower oxygen solubility as  
temperature rises;  
lower oxygen concentration of water reaching gills / less oxygen  
available from the water to diffuse into the gills;  
higher metabolic rate / faster rates of respiration / more oxygen  
consumption as temperature rises; 2 max

(b) not enough energy/ATP/aerobic respiration (for muscle contraction/movement) 1

(c) (i) rising trend overall;  
annual rise and fall / fluctuations; 2

(ii) (CO2 emissions from) increased burning of fossil fuels/deforestation/  
other anthropogenic factor;  
variation in photosynthesis rates during the year / variations in CO2  
uptake in the oceans; 2

(d) (i) diffusion in both directions during each year;  
diffusion from atmosphere to water during most of the year;  
diffusion from water to atmosphere for part of year/autumn/fall/  
seasonal;  
increasing diffusion from water to atmosphere in later years; 2 max

(ii) (no net diffusion because) concentrations will become equal / there  
will be no gradient;  
water concentration higher than atmospheric concentration as often  
as atmospheric concentration higher than water concentration; 1 max

(e) (i) 300 ppm *(Allow answers in the range 295–305 ppm) unit must be  
included to earn mark.* 1

(ii) 3.3°C *(Allow answers in the range 3.0–3.3°C) unit must be  
included to earn mark.****N.B.*** *A maximum of* ***[1]*** *per exam can be deducted for a  
missing unit.* 1

(f) positive correlation / higher temperature with higher CO2 concentration 1

(g) oceans may cease to act as sink / store for CO2;  
atmospheric CO2 concentration may then rise more rapidly;  
atmospheric CO2 concentration is higher than for at least 400 000 years/  
any time in recent (geological) time;  
Antarctic temperatures will (probably) rise higher than at any time in  
400 000 years/any time in recent (geological) time;  
rising (sea water) temperature would reduce oxygen availability in water;  
significant changes in habitat/abiotic factors;  
populations may not be able to adapt; 3 max

[18]