1.
1 COPD higher in villages than cities **; ora**
2 COPD increasing in both areas **;**
3 increasing more rapidly in villages **;**
4 fluctuation / COPD decreases, in cities in 2001 **;**
5 data quote comparing villages and cities including year and million **;**

suggest
6 lack of healthcare in villages **;**
7 more people smoke in villages / passive smoking **;**
8 lack of awareness / education, in villages **;**
9 pollution in villages **;**
10 poor quality housing in villages **;**
11 differences in diet **;**
12 AVP **;** e.g. lack of physical activity **;**

B).I

1 nasal hairs, trap particles / AW **;**
2 goblet cells secrete mucus **;**
3 particles trapped in the mucus **;**
4 cilia moving the mucus **;**
5 mucus (containing particles) moved, away from the gas exchange surface / towards the throat / AW **;**
6 mucus, swallowed / AW **;**
7 AVP **;** phagocytes / sneezing

II)

more oxygen **;**
less carbon dioxide **;**
less water vapour **;**

C.I) intercostal **;**

II) (pressure) decreases and (volume) increases **;**

2A) $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$ (+ energy released) **;;**

B) 150(%) **;;**

C)

demand for, energy / oxygen, increases **;**
(rate of) respiration increases **;**
limited supply of oxygen to muscle (tissue) **;**
idea that heart / pulse / breathing, rate not increased enough **;**
muscles respire anaerobically **;**
lactic acid is produced **;**

D)
horses continue to breathe, at high rate / deeper **;**
continue with a high, heart / pulse, rate **;**
to provide, enough / AW, oxygen (to 'pay-off' the debt) **;**
lactic acid, moves / diffuses / AW, (from muscle) into blood **;**
lactic acid transported to the liver **;**
(in the liver) lactic acid is, broken down / oxidised / respired (aerobically) **;**

3A : $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$ (+ energy released) **;;**

B.I)

volume **;**
distance / length **;**
control / maintain / regulate / stabilise / keep / constant / sustain **;**

II)
carbon dioxide will affect, results / volume of gas
(in respirometer) / carbon dioxide could kill the larvae **;**

III)
growth / development **;**
active transport **;**
protein synthesis **;**
cell division / mitosis **;**
passage of nerve impulses **;**
muscle contraction **;**

AVP **;** e.g. metabolism / (description of) metamorphosis

C)

prediction
as temperature increases the respiration rate will increase **; ora**
and then decrease **;**

explanation:
there will be an optimum temperature (at a particular temperature) for seed germination **;**
ref to (respiratory / germination) enzymes **;**
at high temperatures enzymes denature / described **;**
at low temperatures not enough (kinetic) energy for, effective collisions / biochemical reactions / respiration / digestion **; ora**
AVP **;**

4A): $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$ (+ energy released) **;;**

B): 0.42 (ppm s^{-1}) **;**

C)

to allow oxygen to enter the chamber **;**
keep the crickets respiring aerobically **;**
to remove carbon dioxide **;**
to prevent death of crickets **;**
ref. to ethical treatment of animals **;**
maintaining similar conditions / resetting, for repeat readings / AW **;**

D)

heat (energy) is released by crickets **;**
movement / *ref. to* kinetic energy **;**
pressure increase **;**
increased carbon dioxide leading to greenhouse effect **;**
small closed space **;**

E)

rate of oxygen consumption increases with body mass of crickets (for each temperature) **;**
any suitable data quote comparing rate at different masses (at same temperature) **;**
rate of oxygen consumption increases with temperature **;**
any suitable data quote comparing rate at two temperatures (for the same body mass) **;**

5) $C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2$ **;;**

6)

1 large surface area **;**
2 thin (surface) / one cell thick **;**
3 short diffusion distance **;**
4 good blood supply / many capillaries **;**
5 good ventilation / good movement of air *or* water / good oxygen supply **;**
6 permeable **;**
7 moist **;**

7) yeast **;**

8)deeper (breaths) / increased volume (of lung) **;**

faster (rate) **;**
AVP **;**

9A)

watch chest / abdomen, rise and fall / use a spirometer **;**
ref. to time / in one minute **;**

B)

exercise will increase breathing rate ;
after exercise the breathing rate, will start decreasing / levels off ;

C)

description
carbon dioxide constant / at 4.7% , before exercise **;**
carbon dioxide highest / higher, at 6.0% / (immediately) after exercise **;**
decreases**;**
falls below resting level / AW **;**
comparative data quote **;**

explanation
removal of excess carbon dioxide **;**
more energy used during exercise means higher rates of respiration **;**
aerobic respiration releases carbon dioxide **;**
oxygen not supplied fast enough (from lung / heart) / more oxygen required by muscles **;**
oxygen debt **;**
anaerobic respiration (in muscles) **;**
(produces) lactic acid / lactate**;**
lactic acid is, broken down / respired / converted to glucose / converted to carbon dioxide **;**

10)

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

11)

carbon dioxide / CO_2 / water / H_2O (vapour) **;**
(respiring / all) cells / tissues / mitochondria / named tissue(s) /
named organ(s) **;**

12)

1 low (concentration) of lactic acid in blood at, rest / the start / before **;**
2 lactic acid (concentration) increases, steeply / quickly / AW, during exercise **;**
3 reaches a peak / increases and decreases **;**
4 decreases steeply, then gradually after exercise **;**
5 any use of figures **;**

explanation
6 oxygen, demand increases / does not reach muscles fast enough / AW **;**
7 anaerobic respiration **;**
8 provides / releases, energy **;**

9 anaerobic respiration produces lactic acid **;**
10 lactic acid diffuses from muscles into the blood **;**
11 lactic acid is, broken down / respired / oxidised / converted to glucose / AW **;**
12 in the liver **;**
13 ref. to oxygen debt **;**

b.i): P 12 (km h^{-1}) **and Q** 10 (km h^{-1}) **;**

ii)

idea that trained athlete / **P**, has a higher level of (aerobic) fitness (than **Q**) **;**
difference in, gender / age / height / mass / lung capacity / lung mass / stroke volume / muscle type **;**
AVP **;**

iii)

1 increase in demand for energy **;**
2 increase in (aerobic) respiration **;**
3 increase in demand for oxygen **;**
4 increase in carbon dioxide (concentration) **;**
5 decrease in pH / increase in acid, in the blood **;**
6 detected by the, brain / chemoreceptors **;**
7 (brain stimulates) an increase in breathing rate / faster breathing **;**
8 (brain stimulates) an increase in depth of breathing / AW **;**
9 ref to negative feedback in correct context **;**

13)

1 mitochondria are site of aerobic respiration / production of (most of the) ATP ;
2 liver cell / heart cell, is very active / use lots of energy / respire more ;
3 e.g. function of liver cell or heart cell ;
4 sperm cells, are active / swim / beating flagella ;
5 sperm cells have few mitochondria, as they are small ;
6 red blood cells, full of haemoglobin / more space for oxygen / AW ;
7 red blood cells, use less energy / do not actively move ;

14a) $C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2$;;

b.i)
4.1 (cm^3 per min) ;

ii)

a single line below the original curve on the graph and following the same shape ;
line starts at origin ;

iii)

enzymes denatured / yeast died ;

c)

(named) alcohol production ;
producing biofuels / ethanol ;
production of yeast extract ;
GM yeast ;

15)

function	letter	name
structure that makes sounds	A	larynx
bone that provides protection for the lungs	E	rib ;
airway that allows passage of air only into the right lung	J	bronchus ;
airway that allows passage of air into both lungs	B	trachea ;
contracts to increase the volume of the thorax	F/G	(F) diaphragm / (G) external intercostal muscle ;
muscle that contracts to lower the ribcage	K	internal intercostal muscles ;
site of gas exchange	M	alveoli ;

b)

keeps, airways / trachea / bronchi, open ;
allows (free flow of) air into (the lungs) ;
allows flexibility / can breathe even when, bent / swallowing / AW ;
AVP ;

c.i) (aerobic) respiration ;

ii) rate (of breathing) increases ;