1)

(a)	(i)				**Mark the first answer on each numbered line.**
		1	the elderly / older people ;		1 ACCEPT ref to any age over 50
		2	'at risk' children / young people ;		2 ACCEPT the young / infants / babies IGNORE refs to age
		3	pregnant women ;		
		4	those with compromised immune systems ;		4 ACCEPT weak ACCEPT e.g. with AIDS / HIV / on immunosuppressant drugs / ref cancer
		5	those with chronic diseases ;		5 ACCEPT e.g. heart conditions / lung conditions / asthma / diabetes
		6	health workers ;		
		7	poultry workers / pig farmers ;	**2 max**	7 ACCEPT other professions working with animals, e.g. vets
(a)	(ii)		different strains of the virus / virus mutates (each year) ;		IGNORE 'different types' or 'virus changes' or 'different strands' ACCEPT (influenza) pathogen
			(new strains have) different antigens ;		CREDIT antigenic shift / drift
			idea that antibody produced , needs to match new strain / antigen ; ora	**2 max**	ora original antibody does not match new antigen

(a)	(iii)				**Mark the first two differences** IGNORE answers, e.g. 'size of response' or 'response is faster' that do not refer to a feature of the secondary or primary response
			secondary response , starts earlier / has shorter delay before response ; ora		CREDIT 'shorter lag time'
			secondary response , more rapid / faster ; ora		ACCEPT steeper ACCEPT bigger
			secondary response , higher / produces more antibodies ; ora	**2 max**	IGNORE 'secondary response lasts longer' as this is not clear from graph
(a)	(iv)	1	recognise , virus / antigen / pathogen ;		1 ACCEPT description of recognition IGNORE find / detect
		2	produce a clone ;		2 ACCEPT ref to clonal expansion ACCEPT 'divide by mitosis to produce large numbers'
		3	can , change to / form , plasma cells (on infection) ;		
		4	make antibodies (against influenza , virus / antigen) ;		4 IGNORE 'reproduce antibodies' IGNORE 'release antibodies'
		5	responsible for secondary response / destroy virus before symptoms appear ;		5 IGNORE refs to speed of response unqualified
		6	can , change to / form , named T-cell ;	**3 max**	

(b)	(i)		(antibiotics) are, not effective against viruses / effective (only) against bacteria (and fungi / protozoa) ;	**1**	ACCEPT antibiotics do not kill viruses IGNORE viruses are resistant to antibiotics ACCEPT correct ref to detail of antibiotic action, e.g. 'antibiotics attack cell wall which is not present in influenza (virus)'
(b)	(ii)	1	Tamiflu® is , competitive / non-competitive inhibitor ;		
		2	correct detail of inhibition method that does not contradict stated type of inhibition ;		2 e.g. fits or binds to active site / complementary shape to active site / competes for the active site OR fits into allosteric site or site other than active site / changes shape of active site
		3	prevents , substrate binding to active site / formation of enzyme-substrate complex / formation of ESC ;	**2 max**	3 IGNORE substrate binding to enzyme
(b)	(iii)		fewer , viruses / pathogens , produced ;		
			fewer , viruses / pathogens , (in droplets) when , sneezing / coughing ;		
			(as) viruses / pathogens , cannot leave cell ;		
			(so) cannot , infect / spread to , other cells ;		
			idea of treating , large / proximate , population ;	**2 max**	IGNORE herd immunity / ring vaccination
(c)			(plants) already identified as likely to have , medicinal properties / few side effects / AW ;		ACCEPT 'known / proven to work'
			reduces , time / effort , in finding , plants / active chemicals ;		ACCEPT reduced time for testing
			(possibly) reduces cost ;	**2 max**	

2)

(a)	(i)	both rise (between 1920 and 1960) ; men started smoking before, ca. 1900 / women's smoking started increasing after 1920 - 1925 ; similar levels of smoking (in men and women) by 1990 ; smoking in men , levelled off / plateaued OR smoking in women continues to rise ;	2 max	Needs direct comparison in single statement ACCEPT comparative statement, e.g. 'women started smoking later than men' ACCEPT 5000 in both by the end of the 1980s DO NOT CREDIT if plateau described before 1940
(a)	(ii)	(positive) correlation / similar pattern , between smoking and lung cancer ; *idea that* increase in incidence of lung cancer lags behind increase in smoking ; *idea of* once smoking has levelled off there is a corresponding levelling off in incidence of lung cancer ; *idea of* men always smoking more and men having higher rates of cancer ; **ora**	2	ACCEPT similar shaped graphs IGNORE 'as smoking increases, so does lung cancer' ACCEPT followed by ACCEPT if answer implies levelling off at same time

(b)		1 tar / (cigarette) smoke , contains carcinogens / is carcinogenic ; 2 benzopyrene / formaldehyde / other e.g. ; 3 enters , lung / epithelial , cells ; 4 *idea that* destroyed cilia prevent removal of , carcinogens / tar , which then have greater contact time with epithelial cells ; 5 enters nucleus / in contact with DNA ; 6 causes mutation ; 7 proto-oncogenes to oncogenes ; 8 uncontrollable , cell division / mitosis ; 9 formation of , tumour / mass of cells ; 10 no , programmed cell death / apoptosis ;	5 max	1 IGNORE cigarettes 5 'contact with DNA' needs to be stated not implied 6 IGNORE description 7 ACCEPT switching on (proto)oncogenes 8 ACCEPT cell multiplication IGNORE growth IGNORE ref to speed of cell division 9 ACCEPT lump (of cells)
		QWC ~ showing link between smoking and lung cancer ;	1	1 mark awarded from mps **1** to **5** **and** 1 mark awarded from mps **6** to **10**

(c)		1 mouth / tongue / throat / oesophageal , cancer ; 2 chronic bronchitis / COPD ; 3 emphysema / COPD ; 4 atherosclerosis ; 5 thrombosis ; 6 coronary heart disease / CHD / angina / heart attack / myocardial infarction / MI ; 7 stroke ; 8 peripheral vascular disease / arteriosclerosis ;	max 3	**Mark the first answer on each numbered line.** 1 ACCEPT secondary cancers 2 DO NOT CREDIT smoker's cough 3 CREDIT COPD once only 5 IGNORE thrombus 6 IGNORE cardiovascular disease / hypertension / chronic heart disease

3)

(a)	(i)	3 parts to body ; head + thorax + tail ; segmented ; lateral spines / spines from both sides of head ; thorax / tail , similar shape ;	3 max	**Mark the first answer on each numbered line.** ACCEPT wherever seen ACCEPT 'a lateral spine' ACCEPT description of thorax / tail shape

(a)	(ii)	anterior spine (from head) on A ; longer lateral spines on B ; less rounded / AW , head on B ; any other reasonable difference ; ;	2 max	**Mark the first answer on each numbered line.** Answers must state either species A or species B ACCEPT ora throughout e.g. (greater) fusion of tail segments in B grooves around edge of head in B outline of tail section (more) curved in A A has more segments CREDIT any clear description of a difference
(b)		1 *idea of* fossils show changes over time ; 2 *idea that* there are methods to date fossils ; 3 *idea of* simplest / most different from modern , species / AW , in oldest rocks ; 4 *idea of* showing , links / relationships , between , groups / species / organisms / taxa ; 5 many fossils organisms no longer exist ; 6 *idea of* compare DNA extracted from some fossils ;	2 max	2 ACCEPT it is possible to date fossils 4 ACCEPT ref to common ancestor of two species Answers could refer to links between species A and species B

4)

(a)		1 different species ; 2 different genus ; 3 genetically incompatible ; 4 (may have) different number of chromosomes ; 5 physical / behavioural , reason for reproductive incompatibility ;	2 max	3 ACCEPT 'DNA sufficiently different' IGNORE refs to meiosis 4 IGNORE refs to meiosis 5 e.g. eggs remain unfertilised / different incubation patterns IGNORE refs to fertility of offspring
(b)	(i)	Convention (on) International Trade (in) Endangered Species ;	1	ACCEPT Commission / Conference / Congress ACCEPT Trading DO NOT CREDIT Conservation / Countries
(b)	(ii)	1 regulate / monitor , trade in selected , species / animals / plants / animal products ; 2 *idea of* ensuring trade does not put wild populations at risk ; 3 *idea of* prohibiting commercial trade in wild plants ; 4 *idea of* allowing trade in artificially propagated plants ; 5 *idea of* allowing trade in less endangered species subject to permit ;	2 max	**Mark the first two answers only.** IGNORE trafficking throughout (as in stem) 1 ACCEPT idea of species being on a list ACCEPT endangered ACCEPT prevent IGNORE illegal IGNORE animals / plants unqualified 3 ACCEPT endangered plants
(c)		unrelated / AW, individuals ; health ; of reproductive age ; selecting individuals of opposite sex (for breeding) ; select higher proportion of females ;	2 max	ACCEPT idea of individuals with sufficiently different genes ACCEPT 'whether they are healthy (or not)' ACCEPT fertility of individuals
(d)		1 bird(s) healthy / quarantine before release ; 2 adequate (natural) food supply / provide food (if necessary) ; 3 protected reserve / no hunting / no poaching / legal protection ; 4 method to monitor population ; 5 raise public awareness / educate local population / educate collectors ; 6 method to prepare animals for survival in wild ; 7 *idea of* gradual introduction, e.g via semi-wild habitat ;	3 max	1 IGNORE refs to ongoing health monitoring 3 ACCEPT ref to controlling predators 4 e.g. tag birds 5 ACCEPT involve local population 6 e.g. raise with minimal human contact, predator awareness training ACCEPT teaching it to find food

5)

(a)

feature	arterial blood	tissue fluid	lymph	
hydrostatic pressure	high	low	low	;
presence of large proteins	yes	no no OR yes yes		;
presence of neutrophils	yes	yes	(yes / no)	;
presence of erythrocytes	yes	no	no	;

4

Mark the first answer for each box. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks**

Award 1 mark per correct row.

IGNORE yes and no in first row

ACCEPT some / few / low / usually, for yes in rows 2 and 3
DO NOT CREDIT not usually for yes

In row two mark is awarded for idea that tissue fluid and lymph are the same (proteins in tissue fluid will enter lymph) - both responses must be the same to achieve a mark.

Mark is awarded for tissue fluid response only.

(b) (i)

maintain / high(er), (blood) pressure ;

increase rate of, flow / delivery ;
flow can be, diverted / directed / AW ;

2 max

Mark the first suggestion on each prompt line.
IGNORE separates oxygenated from deoxygenated blood
IGNORE generate / create, pressure
IGNORE ref to pressure gradient

ACCEPT blood moves faster / quicker
IGNORE ref to going to, all cells / where needed

(ii)

to withstand pressure
D1 wall is thick ;
D2 (thick layer of) **collagen** ;
E3 (wall / collagen) provides strength ;

D4 **endothelium,** corrugated / folded ;

E5 *idea of:* no damage to, endothelium / artery (wall) (as it stretches) ;

max 3

to maintain pressure
D6 (thick layer of) **elastic** tissue / elastic fibres / **elastin** ;
E7 to cause **recoil** / return to original size ;

D8 (thick layer of) **smooth muscle** ;
E9 narrows / constricts, **lumen** / artery ;

E10 AVP ;

max 3

4 max

Ensure that there is at least one D mark and one E mark for four marks
AND
Ensure that there is at least one withstand mark and one maintain mark for four marks

ACCEPT tunica media, tunica adventitia, tunica externa for wall

ACCEPT (wall / collagen) is strong

ACCEPT tunica intima for endothelium
IGNORE lining
IGNORE prevents artery bursting / breaking
ACCEPT wall will not tear

IGNORE elastic unqualified

Ref to lumen must be in context of explaining how pressure is maintained eg makes lumen small(er) = 1 mark
DO NOT CREDIT in context of constriction to push or pump the blood along the artery
IGNORE 'lumen is narrow' or 'has small lumen' as these are a description of the lumen not referring to the wall
eg:
idea of: blood is forced (through narrow, channel / lumen)
idea of: restriction of blood flow to one area allows pressure to be maintained elsewhere

QWC rubric continued on next page.....

(b)(ii)

Q QWC - two technical terms used and spelt correctly ;

1

Words must be used in correct context and section.
any **2** from:
withstanding pressure:
collagen **endothelium / endothelial**

maintaining pressure:
elastic / elastin recoil **smooth muscle**
lumen **constrict(ion)**

6)

(a)	(i)	increases / rises / goes up ; use of figures to illustrate ;	2	figures must include **mean values** for two comparative points within the range either stated or calculated. eg (between 20 and 50) it rises from 5.7 to 32.3 eg (between 20 and 50) rate rises by 26.6 eg between 30 and 40 rate rises from 11.7 to 24.3 eg between 20 and 50 rate rises by 467% **IGNORE** units **Note:** as light intensity goes from 20 to 50, the rate increases from 5.7 to 32.3 = **2 marks** **DO NOT ACCEPT** figures that include 10 a.u. (as not asked for in the question)
	(ii)	stomata are (nearly) closed ; *idea that*: light intensity not high enough ;	1 max	**ACCEPT** no extra stomata are opened / stomata are not opened wider
(b)	(i)	**1** stomata are open ; **2** allow, gaseous exchange / entry of carbon dioxide / exit of oxygen ; **3** for photosynthesis ; **4** water vapour leaves (the leaf) ; **5** down a water (vapour) potential gradient ; **6** high(er) temperatures (during the day) ; **7** causes greater evaporation / some water vapour loss through leaf surface all the time ;	3 max	**DO NOT CREDIT** if gases are described moving in wrong direction **IGNORE** ref to respiration **ACCEPT** description of light independent stage **ACCEPT** Ψ for water potential

	(ii)			**IGNORE** ref to moisture / moist air **IGNORE** ref to sunken / small / closed / few stomata
		1 thick , **cuticle** / waxy or layer ;		**ACCEPT** waterproof for waxy
		2 leaf is, folded / rolled / curled / curved / AW ; **3** reduces (exposed) **surface area** (for evaporation) ;		**DO NOT CREDIT** ref to surface area to vol ratio / SA:Vol
		4 hairs ;		**DO NOT CREDIT** if hairs described in wrong place eg on palisade **DO NOT CREDIT** cilia
		5 reduces, **evaporation** / **diffusion** through leaf, surface / **epidermis**) ;		**DO NOT CREDIT** evaporation of water vapour
		for points 6, 7 & 8 credit only in context of folded leaf or hairs: **6** trap **water vapour** ;		**ACCEPT** water vapour builds up in enclosed area **ACCEPT** stop wind blowing, water vapour / diffusion shells, away **ACCEPT** humid air collects in enclosed space
		7 creates high **water (vapour) potential** outside (stomata) ; **8** reduces **water (vapour) potential gradient** ; **max 4**		**ACCEPT** Ψ for water potential **DO NOT CREDIT** high water potential gradient outside stoma
		Q QWC – two technical terms used and spelt correctly ; **1**	5 max	any **2** from: **cuticle** (derivatives of) **evaporation** **water vapour** **potential gradient** **epidermis** **surface area** **diffusion**