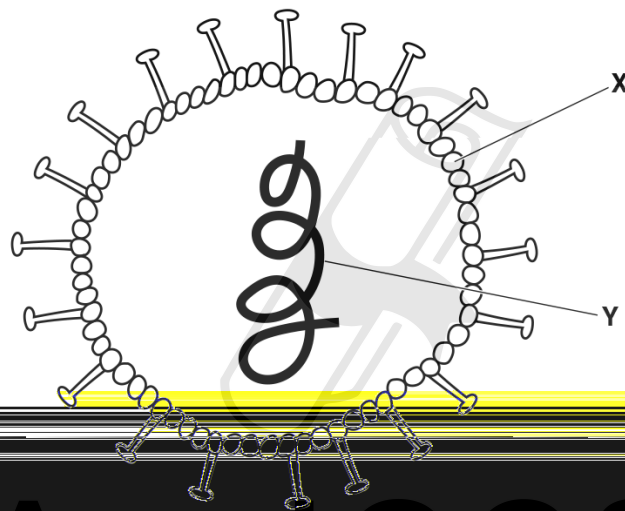


Chapter 10

Diseases and immunity

01. 0610_m19_qp_42 Q: 6

Fig. 6.1 is a diagram of the virus that causes measles.



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(a) (i) State the structure of the nucleocapsid in Fig. 6.1. 2

X

Y

(ii) State two ways in which the structure of measles differs from the structure of viruses.

1

2

2

02. 0610_s17_qp_41 Q: 2

The genes for antibodies are only active in lymphocytes.

(a) Define the term *gene*.

.....
.....
.....[2]

(b) Lymphocytes produce antibodies.

Outline the role of antibodies in the defence of the body against pathogens.

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....[4]



(c) Fig. 2.1 is a drawing made from an electron micrograph of a lymphocyte that produces antibodies.

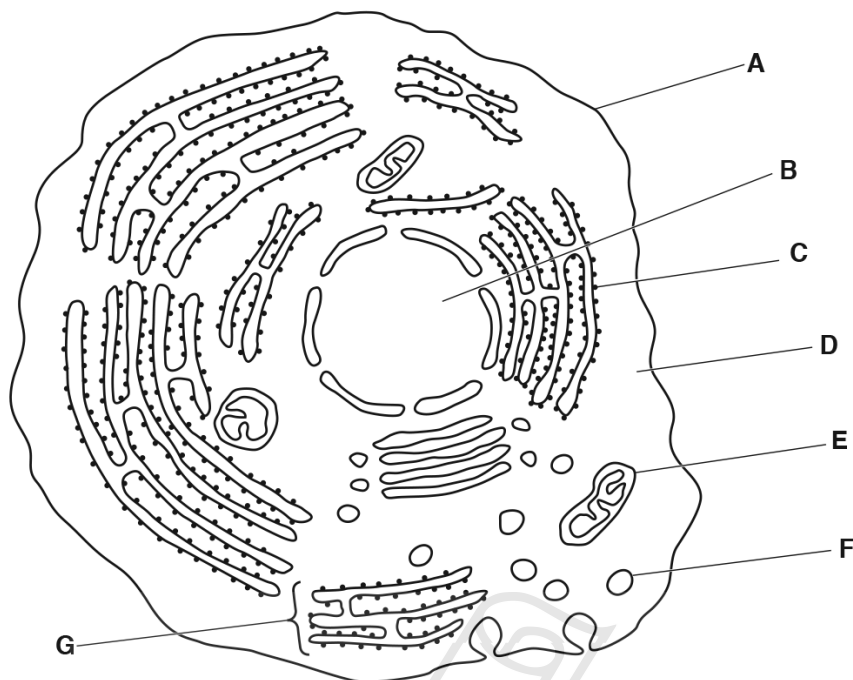


Fig. 2.1

Table 2.1 contains statements about the structures visible in Fig. 2.1.

Complete Table 2.1 by

- naming the structure
- identifying the letter that labels the structure.

The first one has been done for you.

Table 2.1

function	name of structure	letter from Fig. 2.1
absorption of amino acids used in making antibodies	cell membrane	A
stores genetic information as DNA		
provides energy for making antibodies		
site of production of antibodies		
transport of antibody molecules for release into blood		

[4]

(b) Fig. 6.1 shows four different viruses.

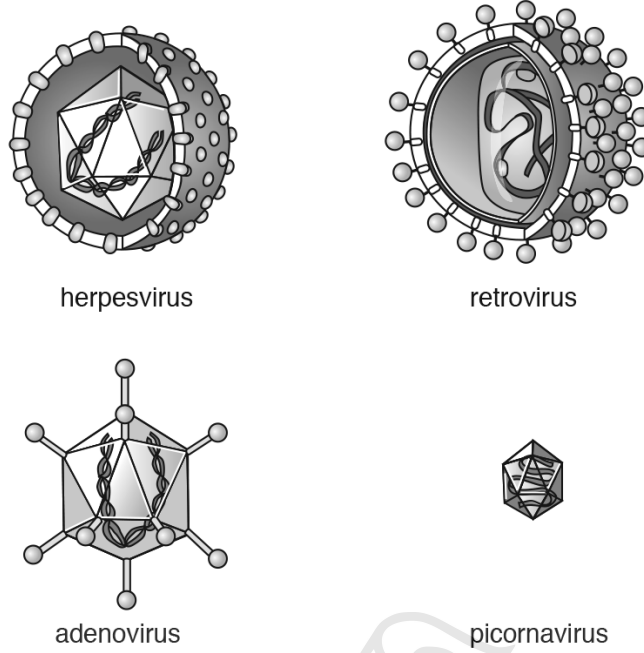


Fig. 6.1

Suggest **one** feature that could be used to classify viruses into groups.

.....
.....[1]

[Total: 8]

Fig. 5.1 shows the bacterium *Helicobacter pylori*, which is a human pathogen.

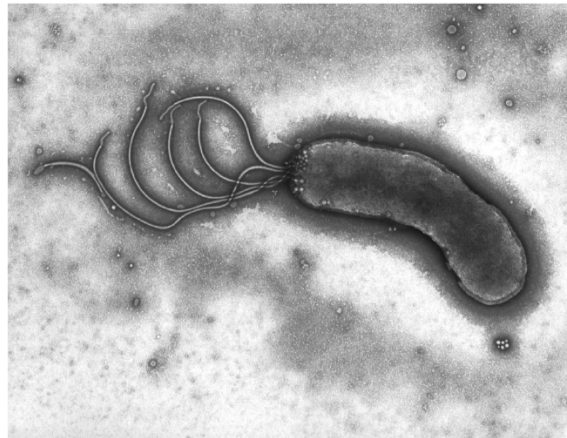


Fig. 5.1

(a) State the genus of *Helicobacter pylori*.

.....[1]

(b) *H. pylori* is placed in the prokaryote kingdom.

State **two** structural features that *H. pylori* shares with other prokaryotes.

1

2

[2]

(c) (i) *H. pylori* can cause infections in the stomach.

Suggest how this infection could be treated.

.....[1]

(ii) State **one** natural body defence that is found in the stomach.

.....[1]

Fig. 2.1 is an electron micrograph showing the bacteria, *Vibrio cholerae*.

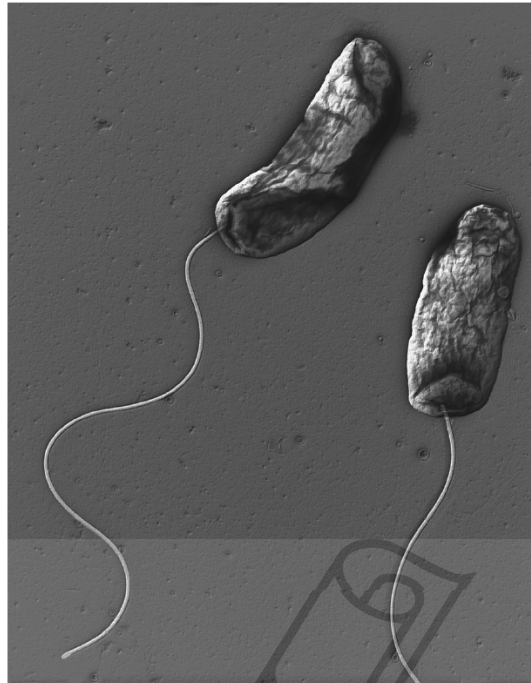


Fig. 2.1

(a) (i) Bacteria are prokaryotes.

State two distinguishing features of all prokaryotes.

1

2

[2]

(ii) The bacteria shown in Fig. 2.1 each have a flagellum.

Suggest the function of the flagellum in bacteria.

.....

.....

.....

[1]

- (i) Calculate the difference in flow of chloride ions between the cells with the toxin and the cells without the toxin at 50 seconds.

Show your working and state the units in your answer.

..... [2]

- (ii) Use the data in Fig. 2.2 to describe the effect of the toxin on the flow of chloride ions out of the cells.

.....
.....
.....
.....
.....
.....
.....
.....

[3]

- (iii) Chloride ions cannot move out of cells by simple diffusion.

Suggest **and** describe how chloride ions could move out of cells.

.....
.....
.....
.....
.....
.....
.....

[3]

(d) The loss of chloride ions from cells causes diarrhoea and dehydration in patients with cholera.

(i) State which organ in the alimentary canal is affected by the cholera toxin.

..... [1]

(ii) Describe the treatment for cholera.

.....
.....
.....
.....
..... [2]

[Total: 18]



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Type 1 diabetes is caused by the immune system destroying body cells.

- (a) (i)** Suggest which organ in the body is attacked by the immune system to cause Type 1 diabetes.

.....[1]

- (ii)** Antibodies are part of the immune system.

Describe how antibodies function.

.....
.....
.....
.....
.....[2]

- (b)** Humans need vitamin D as part of their diet.

- (i)** Describe a cause of vitamin D deficiency in humans.

.....
.....[1]

- (ii)** Describe the effects of vitamin D deficiency in humans.

.....
.....
.....
.....
.....[2]



01. 0610_m19_MS_42 Q: 6

	Answer	Mark	Partial Marks
(a)(i)	X protein (coat) / AW ; Y genetic material ;	2	
(a)(ii)	cell wall ; cell membrane ; cytoplasm ; loop of DNA ; (slime) capsule ; flagella ; plasmid ; ribosome ;	2	
(b)(i)	food ; contaminated surfaces ; animals ; air ; water ; soil ;	2	
(b)(ii)	skin / epidermis ; hairs in nose ; mucous membrane ; mucus ; ear wax ;	2	
(c)	a pathogen has antigens (on their surface) ; ref. to specificity / antibodies have complementary shape (to antigen) ; lock onto (specific) antigens / pathogen ; destroy pathogens ; marking for destruction / phagocytosis ; AVP ;	4	
(d)	long-term / ref. to permanent / protects against some recurring diseases ; produces memory cells ; antibodies are produced (by the body) ; slower response ;	3	

	Answer	Mark	Partial Marks																		
(a)	length of <u>DNA</u> ; that codes for a protein ;	2																			
(b)	1 antibodies lock on to antigens ; 2 ref to antigens are on pathogens ; 3 antibodies / antigens, are specific ; 4 antibodies (have shape) complementary to antigen ; 5 antibodies destroy pathogens (directly) ; 6 antibodies, mark / AW, pathogens for destruction by phagocytes / phagocytosis ; 7 AVP ; 8 AVP ;	4	R same shape A description																		
(c)	one mark per row <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th style="text-align: center;">function</th> <th style="text-align: center;">name of structure</th> <th style="text-align: center;">letter from Fig. 2.1</th> </tr> </thead> <tbody> <tr> <td>absorption of amino acids to make antibodies</td> <td>cell membrane</td> <td>A</td> </tr> <tr> <td>stores genetic information as DNA</td> <td>nucleus</td> <td>B ;</td> </tr> <tr> <td>provides energy for making antibodies</td> <td>mitochondrion</td> <td>E ;</td> </tr> <tr> <td>site of production of antibodies</td> <td>ribosome / endoplasmic reticulum / ER</td> <td>C / G ;</td> </tr> <tr> <td>transport of antibody molecules for release into blood</td> <td>vesicle(s) / vacuole</td> <td>F ;</td> </tr> </tbody> </table>	function	name of structure	letter from Fig. 2.1	absorption of amino acids to make antibodies	cell membrane	A	stores genetic information as DNA	nucleus	B ;	provides energy for making antibodies	mitochondrion	E ;	site of production of antibodies	ribosome / endoplasmic reticulum / ER	C / G ;	transport of antibody molecules for release into blood	vesicle(s) / vacuole	F ;	4	A mitochondrion and E
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transport of antibody molecules for release into blood	vesicle(s) / vacuole	F ;																			
(d)	phagocyte ; ingests / engulfs / digests / destroys, pathogens / bacteria / viruses ; platelet(s) ; release substances to promote / AW, blood clotting ; epithelial cells ; provide a barrier / AW ; goblet cells ; produce mucus ; ciliated (epithelial) cells ; move, mucus / pathogens, away from gas exchange surface / AW ; acid-secreting cells (in stomach) ; make <u>hydrochloric acid</u> (to kill bacteria / pathogens) ;	2	A lachrymal (gland) cells ; secretes lysozyme ;																		

03. 0610_w17_MS_41 Q: 6

	Answer	Mark	Partial Marks
(a)(i)	genetic material ; protein coat ; parasitic / pathogenic ; only reproduce in a host / do not show (other) features of living organisms / AW ; very small ; they are not cellular / absence of named organelle; AVP ; cannot be killed / cannot be treated, with antibiotics.	2	A DNA / RNA A virus are non-living.
(a)(ii)	active immunity ; harmless / dead / weakened / attenuated pathogen / microorganisms ; injected / ingested ; ref. to antigens ; (antigen) triggers antibody production ; by lymphocytes ; memory cells (are produced) ; rapid response to reinfection ; long-term immunity ; prevention of spread person to person e.g. no host for pathogen / herd ref to programmes of mass vaccination ; AVP ;	5	.
(b)	shape / size / AW ; genetic material (sequence / type) ; host species / type of disease it causes ; AVP ;	1	

04. 0610_w17_MS_42 Q: 5

	Answer	Mark	Partial Marks
(a)	<i>Helicobacter</i> ;	1	
(b)	circular DNA / chromosome ; plasmid(s) ; cell membrane ; cell wall (not made of cellulose) ; cytoplasm ; capsule ; (small) ribosomes ; flagella ; AVP ;	2	A naked, DNA / chromosome I cilia e.g. pili
(c)(i)	antibiotic(s) ;	1	
(c)(ii)	(stomach / hydrochloric / gastric) acid / HCl / mucus ;	1	
(d)	<i>active immunity</i> 1 exposure to antigen ; ora 2 after, infection by pathogen / vaccination ; 3 immune response occurs / antibodies produced ; <i>passive immunity</i> 4 antibodies acquired from another individual ; 5 e.g. by breast milk / injection of antibodies ; 6 active is, permanent / long-term (immunity) ; ora 7 ref to memory cells, in active / not in passive ; 8 response is slow on first exposure in active ; ora	4	

	Answer	Mark	Partial Marks
(a) (i)	single celled / unicellular ; no (true) nucleus / no nuclear membrane ; loop of DNA ; no, (membrane-bound) organelles ; e.g. no mitochondria / chloroplasts (peptidoglycan / murein) cell wall ; reproduce by binary fission ; small(er) / 70S, ribosomes ; plasmids ;	[max 2]	I DNA strand unqualified A naked DNA I flagella, capsule, pili, cilia R cellulose cell wall
(ii)	swim / movement / AW ;	[1]	
(b)	harmless / attenuated / dead / AW, form of, (named) pathogen / antigen used ; (vaccine) injected / swallowed ; ref to <u>specific / unique / AW</u> , antigen ; <u>lymphocytes</u> make antibodies ; ref to memory cells ; ref to <u>active immunity</u> ; <u>rapid</u> , immune response / AW, if exposure to <u>same</u> pathogen ; herd immunity ; AVP ; e.g. detail of active immunity / smallpox became extinct	[max 4]	A long term immunity
(c) (i)	12 – 0.4 ; 11.6, <u>au</u> / <u>arbitrary units</u> ;	[2]	
(ii)	large / rapid / immediate increases ; peaks at, <u>50 s</u> / <u>12 AU</u> ; then decrease to, around 5 – 4.6 AU / by 125 – 150 s ; fluctuates / stays (fairly) constant, between 125 – 150 s and 250 s / 4.4 and 4.8 ± 0.2 AU ;	[max 3]	I comparisons to 'without toxins' on graph A increases and decreases from 50 s
(iii)	active transport ; (through) <u>protein</u> (molecules / gates / pumps / AW) ; (protein) in cell membrane ; using, energy / ATP (from respiration) ; (movement) against a concentration gradient / AW ;	[max 3]	
(d) (i)	(small) intestine ;	[1]	A large intestine / duodenum / jejunum / ileum / rectum / colon
(ii)	<u>oral rehydration</u> (therapy / salts / treatment / solution) ; drink mixture of, sugar / nutrients <u>and</u> , salt / ions ; <u>replace lost</u> , water / fluids ; water must be, uncontaminated / boiled / sterilised / clean / AW ; antibiotics ;	[2]	A receive intravenous fluids I drink more water
		[Total: 18]	

06. 0610_w16_MS_41 Q: 4

	Answer	Mark	Partial Marks
(a)(i)	pancreas;	1	
(a)(ii)	recognize a specific, pathogen / antigen; lock on antigens / antibody-antigen complex; agglutination / clumping; destruction by, phagocytes / white blood cells / lymphocytes; AVP; e.g. neutralise / inhibit toxins;	2	A bacteria / fungus / virus / parasite
(b)(i)	lack of sun(light) / dark skin AW; lack of fish (oils) / egg (yolk) / liver; unbalanced diet; kidney / liver / digestive, disease;	1	
(b)(ii)	muscle cramps; soft / bent, bones / rickets; stunted growth; prone to infections; fatigue; reduced ability to absorb calcium (ions);	2	
(c)	lack of vitamin D leads to more cases of type 1 diabetes in mice / ora; there is no difference in cases / same number of cases (wrt normal mice) until after 50 days; at 100 days there are more cases (in vitamin D mice); (vitamin D mice) levels off before normal mice / levels off after 150 days; comparative data use ;e.g. 20% more cases at day 200 or at 250 days normal mice is 46% , deficient mice is 65%;	3	
(d)	frequent urination; thirst / AW; hunger; fatigue; weight loss; itchy skin; wounds heal slowly / more susceptible to infection; blurred vision / AW; vomiting; glucose in urine; high blood, glucose/sugar;	4	A nausea A hyperglycaemia.
(e)	insulin; by injection / insulin pump; regular blood sugar tests; regular meals; AVP; exercise / restrict carbohydrate content of diet	3	
		Total: 16	

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