



ASSESSMENT and
QUALIFICATIONS
ALLIANCE

Mark scheme

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GCE

Biology B

Unit BYB7

Section A

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Unit 7: Microbes and Disease**Question 1**

- (a) cell wall;
capsule; 2
- (b) 130 000 / 6.5;
20 000; (*Allow 1 mark for using 6.5 as the denominator*) 2
- (c) membranes (folded to increase the surface area);
(*allow references to phospholipid bilayers – do not award references to cell membranes*)
(sites) for respiration / electron transport chain;
contain electron carriers / cytochromes / enzymes;
(*do not allow references to glycolysis, Krebs cycle*) 2 max
- Total 6
-

Question 2

- (a) correct dilution step (for example, add 1cm³ to 9cm³ for a 1 in 10 dilution or 1cm³ to 99cm³ for a 1 in 100 dilution);
repeat dilutions to achieve 1 in 1000;
(*allow maximum 1 mark if correct volumes are used to achieve 1 in 1000 dilution in a single step*)
using sterile water / named sterile technique / mix; 3 max
- (b) (i) colony / offspring from a single bacterium / growth of bacteria; 1
- (ii) $14 \times 100\,000 = 1\,400\,000$;
 $\times 10$;
(*allow 14 000 000 / 1.4×10^7 for 2 marks*); 2
- (c) extra dilution introduces additional error / not mixed thoroughly; 1
- (d) includes dead cells / a total count; 1
- Total 8
-

Question 3

- (a) enzyme is more stable / active / not denatured over a wider range of pH values / temperatures;
sweeter milk not contaminated by / easily separated from enzyme;
enzyme is reusable / not lost; 2 max
- (b) larger surface area of beads;
(disallow this mark if the enzyme acts on the surface of beads)
more chance of enzyme substrate collisions; 1 max
- (c) chromatography;
two spots on chromatography paper / no spot for lactose / no spot
with Rf value equivalent to lactose;
- or details of a quantitative benedicts test / a glucose biosensor / clinistix strips (for glucose);
(do not award a mark for biosensor unless the sugar detected by it is stated);
suitable end-point (for example, no additional precipitate
is formed / no further increase in glucose levels); 2 max
- Total 5
-

Question 4

- (a) phagocytosis / engulf and digest (*allow ingest, destroy, inactivate*);
antigen presenting; 2
- (b) receptors in hypothalamus detect change in body temperature; (*reference to hypothalamus is sufficient*)
impulses travel along neurons / nerves;
- one of
to (muscles of) arterioles;
causing vasoconstriction / contraction of muscles / less blood to flow
into surface capillaries;
less heat is lost from the body;
- or causing shivering / rapid contraction of skeletal muscles;
with increased rate of respiration / metabolism;
generating (extra) heat;
- or release of thyroxine / adrenalin;
with increased rate of respiration / metabolism;
generating (extra) heat;
- or reduced / no sweating;
less / no evaporation;
less heat is lost from the body;
- or hairs stand erect;
trapping insulating warm air;
less heat is lost from the body;
- 4 max
Total 6
-

Question 5

- | | | |
|-----|--|----------|
| (a) | amino acid; | 1 |
| (b) | X at the end of either or both light chains; | 1 |
| (c) | <u>shape</u> of antigen fits / binds / attaches / complementary to (shape of) antibody; (<i>ignore references to active site</i>) | 1 |
| (d) | allows antibody to lock onto / (easily) make contact with antigen; more likely / able to make contact with 2 / more than 1 (identical) antigens; | 1 max |
| | Total | 4 |

Question 6

- | | | |
|-----|--|-----------|
| (a) | uses / breaks up / digests host nuclear / genetic material (<i>allow references made to DNA / RNA instead of nuclear / genetic</i>);
virus DNA / genetic material inserted into hosts DNA / chromosome / genetic material;
host cells amino acids are used to synthesize viral proteins;
cell lysis;
by enzyme (produced by expressing a virus gene);
toxin production; | 3 max |
| (b) | (shape of) virus fits / binds / attaches to receptors / proteins in the cell membrane (of host); | 1 |
| (c) | antigen / protein structure / shape changed by heat;
(<i>do not allow virus is killed / destroyed or virus / antigen is denatured</i>) | 1 |
| (d) | one type of antigen / protein / shape / one strain of virus;
(<i>allow virus does not mutate or virus does not change</i>)
same immune response generated; | 2 |
| (e) | <i>Award a mark for damage caused to an organ only if it is accompanied by a valid explanation about the effect of the damage.</i> | |
| | { damage to the pancreas;
lack of / no insulin (produced); | |
| | { damage to liver;
insulin no longer affects (liver) cells / does not bind to receptors / does not work / cells are impermeable to glucose; | |
| | { damage to kidneys;
no / less active transport of glucose (across tubule cells) / membrane bound channel proteins destroyed; | |
| | less / no blood glucose converted to glycogen / taken into liver;
kidneys unable to reabsorb (all) glucose; | 4 max |
| | Total | 11 |

Question 7

- (a) infectivity is measured by the number of bacteria required to cause disease (symptoms) / infection;
small numbers needed for *S typhi*;
invasiveness is measured by the spread of the pathogen / bacterium /
typhi / toxin through the body;
S typhi spreads widely (from the point of infection) / in
blood / tissue fluid; 3 max
- (b) bacteria present in faeces;
contaminate food / drinking water / people by shaking hands;
others are infected by consuming (inadequately cooked) food /
drinking water / fingers put in mouth; 3
- (c) for the principle that chloramphenicol could be a competitive /
non-competitive inhibitor;
details about the mode of inhibition (competition with a substrate
for the active site / changed shape of active site so substrate does not fit);
translation (is affected);
effect on the role of tRNA (*allow tRNA does not bind / not attracted to ribosome*);
effect on the role of mRNA (*allow mRNA does not bind to ribosome / tRNA*);
peptide bonds do not form;
amino acids do not join;

4 max
Total 10
