TEACHERS, PLEASE NOTE:

In marking this Trial Exam, teachers should keep in mind that the language used in the suggested answers is sometimes more sophisticated than a student would offer since these answers are written for teachers' information in their correction of the Trial Exam. The answers suggested here might not be the only correct responses possible. Teachers must use their professional judgement in awarding marks for other answers offered. However, in accordance with the VCAA practice, students who give a correct response, and then offer a contradictory incorrect response within the same part of the question, should **not** be awarded any marks for the correct part of the response. Also, in accordance with the VCAA practice, no half marks should be given.

SECTION A – Multiple-choice questions

1	*C*	**15**	*B*	**28**	*C*
2	*A*	**16**	*D*	**29**	*B*
3	*D*	**17**	*C*	**30**	*D*
4	*A*	**18**	*C*	**31**	*A*
5	*B*	**19**	*A*	**32**	*C*
6	*C*	**20**	*B*	**33**	*B*
7	*C*	**21**	*D*	**34**	*A*
8	*D*	**22**	*A*	**35**	*C*
9	*B*	**23**	*B*	**36**	*B*
10	*A*	**24**	*C*	**37**	*D*
11	*B*	**25**	*C*	**38**	*A*
12	*D*	**26**	*D*	**39**	*C*
13	*B*	**27**	*A*	**40**	*C*
14	*A*				

SECTION B

Question 1

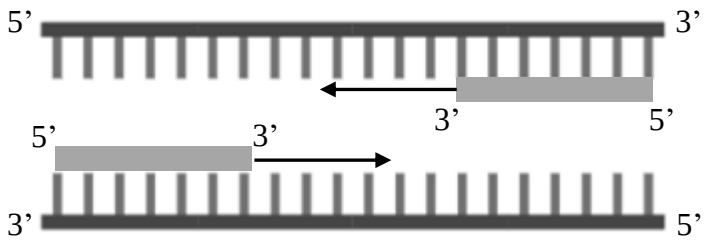
a. *photorespiration* 1 mark

b. *Bundle-sheath cells surround the mesophyll to efficiently transfer malate / C4 molecules (1).*
Stomata are adjacent to the mesophyll for fast initial carbon fixation (1).
C4 plants have less air pockets to store gases exchanged in photosynthesis (1). 3 marks

c. *They revert to the C3 pathway (1) with no separation of carbon fixation by time, with the light dependent and light independent stage both occurring during the day (1).* 2 marks

Total Question 1: 6 marks

Question 2



a. *primers at the 3' end (1), arrows toward the 5' end (1).* 2 marks

b. Any two of the following for (1) each:
Transcription and translation occur at the same time for Taq polymerase in prokaryotic bacteria, but are separated in eukaryotes (1).
No RNA processing occurs in the production of Taq polymerase in bacteria as compared to proteins produced in eukaryotes (1).
Taq polymerase would be produced faster than enzymes in eukaryotes (1). 2 marks

c. *Taq polymerase has an optimal temperature of 72 °C (1). When the DNA sample is heated to 98 °C to separate the strands, Taq is not denatured (1). This allows Taq to catalyse the construction of a new strand in PCR (1).* 3 marks

Total Question 2: 7 marks

Question 3

a. *Competitive inhibitor (1) as it is structurally similar to the molecule which is complementary to the active site of the enzyme (1).* 2 marks

b. *The outputs of the Krebs cycle are inputs for the electron transport chain (1). The electron transport chain produces the greatest amount of ATP in aerobic respiration (1). The individual may not produce enough ATP to sustain life (1).* 3 marks

c. Any three of the following for (1) each:
DNA unzips (1); RNA polymerase binds and catalyses the addition of free nucleotides (1); Uracil replaces Thymine (1); pre-mRNA is produced that is complementary to the DNA strand (1). 3 marks

d. Any two of the following for (2) each:
endoplasmic reticulum (1) − site of post translational modification / folding (1) vesicle (1) transport – move from ER to Golgi OR secretory – move from Golgi to fuse with the plasma membrane (1)
Golgi apparatus (1) – site of final modification and preparation for export (1) 4 marks

Total Question 3: 12 marks

Question 4

a. *Cas9* 1 mark

b. *Cas9 binds to the PAM site (1), (unzips the DNA); if the sgRNA binds (1), Cas9 moves 2−6 nucleotides upstream to cut the desired sequence (1).* 3 marks

c. *Consequence based (1) as the benefits of reducing fungal infection in wheat outweighs any potential risks (1).* 2 marks

d. *Damage / disruption to the ecosystem (1) affecting other species that rely on the fungi to provide nutrients to the soil (1) breaching non-maleficence which is to do no harm (1). Solution − could add a symbiotic species of fungi that does not target wheat to the soil (1).*
***OR** any other suitable response that includes issue (1), implication (1), ethical concept (1) and solution (1).* 4 marks

Total Question 4: 10 marks

Question 5

a. Any one of the following for (1):
*waxy cuticle, vertical hanging leaves, thorns, chitinases, defensins, phenol, oxalic acid **OR** any other suitable response* 1 mark

b. *Plants only have innate responses whereas humans have innate and adaptive (1).*
Plants do not have memory cells whereas humans do (1). 2 marks

c. *Lymph nodes are the site of antigen presentation (1). APCs engulf and digest pathogens (1) and present their antigenic fragments on their MHC II markers to T_H cells (1). T_H cells release cytokines to activate B or T cells (1).* 4 marks

d. *Valves prevent the backward flow of lymph fluid.* 1 mark

e. *step 2. Isolate the B cells (1)*
step 3. Fuse the B cell and myeloma to create a hybridoma (1)
step 4. Select hybridomas with the correct antibody (1)
step 5. Create multiple copies of the correct hybridoma (1) ***OR*** *clone the hybridoma (1)* 4 marks

Total Question 5: 12 marks

Question 6

a. *Variation existed in the bacterial population, some were susceptible to antibiotics, some were resistant (1). When exposed to an environment with antibiotics, those resistant bacteria were able to survive and reproduce (1) whereas those susceptible died (1). Over time, the resistant bacteria became the prevalent phenotype in the population (1)* ***OR*** *the population is now resistant to antibiotics (1).* 4 marks

b. *Limited gene flow reduces the introduction of new alleles into populations which decreases genetic diversity as only those present in the population can contribute their alleles to future populations .* 1 mark

c. *Sequencing resistant bacterial genomes and comparing it to sequences that could be killed with antibiotics (1). Identifying what molecular change occurred that provided resistance can then be used to demonstrate how the bacteria have evolved to become AMR over time (1).* 2 marks

d. Any two of the following for (1) each:
Selective breeding of animals (1); overuse of medication leading to resistance (1); animals living in close proximity to one another (1). 2 marks

Total Question 6: 9 marks

Question 7

a. *Trace evidence (1). Traditional fossils provide a cast or mould of a preserved physical part of the organisms that existed (1). Trace fossils provide evidence that an organism existed in an area, however there is no physical structure left behind (1).* 3 marks

b. Any three of the following for (1) each:
tigers have claws, not nails
tigers do not have opposable thumbs, primates do
tigers cannot rotate their shoulder joint, primates can
tigers rely more on smell, primates rely more on sight
tigers do not have a clavicle, primates do
OR *any other suitable difference* 3 marks

c *Faunal succession is based upon the premise that strata accumulate in chronological order (1). Fossils found in lower strata are older than fossils found in strata closer to the surface (1). Fossils found in lower strata will be less complex than fossils found in strata closer to the surface (1).* 3 marks

d. *Geographically isolated / no gene flow with other tiger populations (1).*
Inbreeding / reduced genetic diversity (1).
More susceptible to extinction due to environmental conditions changing (1). 3 marks

Total Question 7: 12 marks

Question 8

a. *transformed **OR** transgenic* 1 mark

b. *DNA is universal (1) as the same codon codes for the same amino acid in all species (1).* 2 marks

c. *Plates 3 and 4 as they did not have the gene for pGLO (1).*
Plate 3 shows that the antibiotic resistant gene is required for bacteria to grow (1).
Plate 4 shows that for the bacteria to glow, the transformed plasmid must contain all of pGLO, amp, ara, and grown on LB (1). 3 marks

d. Any one of the following for (2):
no repetition (1) − repeat experiment 3 times (1)
no volumes of solutions provided (1) − all plates should have equal amounts of nutrient broth and bacteria (1)
incubation temperature may have varied (1) − state a set temperature (1)
***OR** any other limitation (1) − with a feasible solution (1)* 2 marks

e. *qualitative (1) as the data is not objective / subject to bias (1)* 2 marks

f. *Insulin requires 2 bacterium and 2 plasmids (1). Insulin does not require an additional gene to be expressed (1) **OR** any other suitable difference.* 2 marks

Total Question 8: 12 marks

END OF SUGGESTED SOLUTIONS