1. B

[1]

2. B

[1]

3. B

[1]

4. C

[1]

5. D

[1]

6. D

[1]

7. C

[1]

8. D

[1]

9. D

[1]

10. C

[1]

11. (a) (i)

(GMF) C
1

(ii) $\frac{(50-22)}{22} \times 100$;
=127% ; *(units required) (allow answers in the range of 127 to 127.3)* 2

(b) error bars show the range/variability/uncertainty of the data / *OWTTE*;
error bars/standard deviation about the same length for day 0 and day 11 / spread of data (around the means) about the same;
overlapping bars indicate that there is no (significant) difference in the data/ means;
68% of population within one standard deviation; 2 max

(c) inversely proportional / the higher the tolerance, the less the growth / *vice versa* 1

(d) first name/*Oryza* for genus / second name/*sativa* for species;
(all) members of *Oryza sativa* share special/unique features;
two names make a unique combination to designate species / worldwide recognizable nomenclature;
varieties (*japonica* and *indica*) have some (consistent) differences (in tolerance); 2 max

(e) (i) *Sub1C*
1

(ii) *Sub1A* is expressed strongly/the most / *Sub1A* produces the most RNA;
Sub1B (always) has the lowest expression/produces least mRNA;
Sub1A expressed/produces mRNA for the longest time/days 1 to 10;
Sub1C expressed/produces mRNA for the shortest time/days 3 to 7; 2 max

(iii) *Sub1A* only expressed/produces mRNA in *indica* / not/never expressed/never produces mRNA in *japonica*;
Sub1C expressed/produces mRNA from day 1 in *japonica*, but not *indica*;
Sub1B has lower expression/production of mRNA than *Sub1C* in both varieties;
other accurate comparisons; 2 max

(f) *Sub1A*;
is only expressed in *indica*;

indica is the variety showing submersion tolerance; 2 max

(g) genetically modified rice/rice with *Sub1A* is more tolerant to submersion;
can withstand seasonal flooding/torrential rain;
GMF/tolerant rice ensures greater harvest/provides more food during flooding; 2 max

[17]

12. (a) (i) phosphate 1

(ii) covalent / phosphodiester 1

(b) only the antisense strand is transcribed / the antisense strand is transcribed to mRNA and the sense strand is not transcribed/has the same base sequence as mRNA (with uracil instead of thymine) 1
*To award **[1]**, reference must be made to both strands and transcription.*

(c)

prokaryotic DNA	**eukaryotic DNA**
circular	linear;
in cytoplasm/nucleoid region	enclosed in nuclear membrane / in nucleus;
naked	associated with proteins/histones;
plasmids	no plasmids;
both prokaryotic and eukaryotic DNA consist of a double helix of (deoxy)nucleotides / phosphate, deoxyribose and base/ATC and G;	

2 max

Award marks for paired statements only. Answers do not need to be shown in a table format.

[5]

13. (a) *name of component* ***[1 max]*** *e.g.* plant cell wall/cellulose/interstitial matrix/ basement membrane/glycoprotein/bone matrix;

functions ***[3 max]***
EITHER
e.g. (plant cell wall) strengthens/supports the cell/plant (against gravity);
prevents the entry of pathogens;
maintains the shape of plant cells;
allows turgor pressure/high pressure to develop inside the cell;
prevents excessive entry of water to the cell;

OR
helps cells to stick together/adhere;
needed to hold cells/tissues together / example of cells/tissues holding together;
forms interstitial matrix / forms basement membrane to support single layers of cells;
e.g. around a blood capillary;
forms (part of the) filtration membrane in the glomerulus; 4 max

(b) vesicles carry material to plasma membrane;
vesicle fuses with membrane;
(by joining of) phospholipid bilayers;
aided by the fluidity of the membrane;
material released/expelled from the cell;
membrane flattens;
name of example *e.g.* exocytosis of neurotransmitter / exocrine secretion/ endocrine secretion / hormone secretion / release of cortical granules;
outline of example: (in the presence of calcium), neurotransmitter vesicles release their contents into the synapse / hormones released from one cell have an effect on another cell *etc*.;
Accept these points if clearly made in an annotated diagram. ***[4 max]*** *if no example given.* 5 max

(c) translation involves initiation, elongation/translocation and termination;
mRNA binds to the small sub-unit of the ribosome;
ribosome slides along mRNA to the start codon;
anticodon of tRNA pairs with codon on mRNA:
complementary base pairing (between codon and anticodon);
(anticodon of) tRNA with methionine pairs with start codon / AUG is the start codon;
second tRNA pairs with next codon;
peptide bond forms between amino acids;
ribosome moves along the mRNA by one codon;
movement in 5′ to 3′ direction;
tRNA that has lost its amino acid detaches;
another tRNA pairs with the next codon/moves into A site;
tRNA activating enzymes;
link amino acids to specific tRNA;
stop codon (eventually) reached; 9 max

*(Plus up to **[2]** for quality)*

[20]