VICTORIAN CURRICULUM AND ASSESSMENT AUTHORITY

Victorian Certificate of Education 2013

SUPERVISOR TO ATTACH PROCESSING LABEL HERE

STUDENT NUMBER

									Letter
Figures									
Words									

VCE VET LABORATORY SKILLS

Written examination

Thursday 21 November 2013

Reading time: 9.00 am to 9.15 am (15 minutes)
Writing time: 9.15 am to 10.45 am (1 hour 30 minutes)

QUESTION AND ANSWER BOOK

Structure of book

Section	*Number of questions*	*Number of questions to be answered*	*Number of marks*
A	20	20	20
B	15	15	80
			Total 100

- Students are permitted to bring into the examination room: pens, pencils, highlighters, erasers, sharpeners, rulers and one scientific calculator.
- Students are NOT permitted to bring into the examination room: blank sheets of paper and/or white out liquid/tape.

Materials supplied
- Question and answer book of 17 pages.
- Answer sheet for multiple-choice questions.

Instructions
- Write your **student number** in the space provided above on this page.
- Check that your **name** and **student number** as printed on your answer sheet for multiple-choice questions are correct, **and** sign your name in the space provided to verify this.
- All written responses must be in English.

At the end of the examination
- Place the answer sheet for multiple-choice questions inside the front cover of this book.

Students are NOT permitted to bring mobile phones and/or any other unauthorised electronic devices into the examination room.

SECTION A – Multiple-choice questions

Instructions for Section A

Answer **all** questions in pencil on the answer sheet provided for multiple-choice questions.
Choose the response that is **correct** for the question.
A correct answer scores 1, an incorrect answer scores 0.
Marks will **not** be deducted for incorrect answers.
No marks will be given if more than one answer is completed for any question.

Question 1

The correct way to light a Bunsen burner is to

A. ensure the air hole is fully open before lighting the match, then turn on the gas.
B. ensure the air hole is closed before lighting the match, then turn on the gas.
C. turn on the gas, with the air hole closed, before lighting the match.
D. turn on the gas, with the air hole open, before lighting the match.

Question 2

Where would you expect to find a record of the roles and responsibilities of a laboratory technician?

A. a quality manual
B. a chemical register
C. a laboratory logbook
D. a material safety data sheet (MSDS)

Question 3

An insoluble substance formed by mixing two solutions together is called a

A. solute.
B. solvent.
C. solution.
D. precipitate.

Question 4

Urine samples arrive at a pathology laboratory and are examined for bacterial cells under a light microscope. What is the first step in this process?

A. Use a sterile pipette to place a drop of urine onto a clean slide.
B. Log the samples, and put on gloves, safety glasses and a laboratory coat.
C. Mix the urine samples with a dye, and centrifuge to remove any sediment.
D. Make a smear of a drop of urine by drawing one slide along the surface of another.

Question 5

For a team to work efficiently, it is best to

A. meet socially outside of work.
B. allocate work fairly and resolve problems quickly.
C. elect the most popular team member as the leader.
D. know the likes and dislikes of other team members.

Question 6

A laboratory technician working at a mine site has been asked to examine rock samples and take digital photos to show their surface structure.

What type of microscope would the technician use?

A. stereo

B. electron

C. compound light

D. inverted phase contrast

Question 7

In a laboratory, regularly reviewing work practices is important in order to

A. become more familiar with the organisation's delivery of products and services.

B. ensure that you follow the organisation's procedural guidelines.

C. identify opportunities for improving work performance.

D. ensure the accuracy of test results.

Question 8

While working with water samples from a sewage treatment plant, you accidentally spill a small amount of one sample onto the bench.

Which one of the following response procedures is the most appropriate?

A. Spray with disinfectant, wipe up the spill with a paper towel and put the paper towel into the biohazard waste bin.

B. Evacuate the area, call for assistance and read the MSDS before cleaning up the spill.

C. Use a paper towel to wipe up the spill and dispose of it in the biohazard waste bin.

D. Use the laboratory sponge to wipe up the spill.

Question 9

The best method to check the sterility of a flask containing animal tissue culture cells is to

A. examine a drop of the culture solution under a light microscope.

B. use an inverted phase contrast microscope to examine the whole flask.

C. incubate the flask at 37 °C for 48 hours and check for cloudiness by eye.

D. plate a sample of the culture onto a nutrient agar plate, incubate it for 24 hours and then check for growth.

Question 10

The formation of aerosols in aseptic procedures must be avoided because

A. they create a messy laboratory environment.

B. there will be unnecessary loss of your original sample.

C. they may make surfaces slippery and equipment hard to handle.

D. they are an inhalation hazard to laboratory workers in the vicinity.

Question 11

What is the correct way to dilute a concentrated acid?

A. Pour the acid into the water.

B. Pour the water into the acid.

C. Heat the container used to mix the water and acid.

D. Cool the container used to mix the water and acid.

Question 12

The purpose of documenting a procedure is to

A. minimise transcription errors.

B. make sure the same equipment is used.

C. ensure the operator obtains data within range.

D. allow results to be compared with those of other laboratories.

Question 13

Prokaryotic cells

A. are visible to the naked eye.

B. are only visible when viewed with a transmission electron microscope.

C. are easy to see at low magnification when examined under a light microscope.

D. require examination with an oil-immersion lens that has a total magnification of 1000x.

Question 14

A common error that will cause a sample always to appear out of focus under a microscope is

A. setting the intensity of the lamp too high.

B. placing a slide upside down on the stage of a microscope.

C. adding too much stain to a sample, making it too dark to view.

D. not turning the objective lens completely around and leaving it only partially over the sample.

Question 15

A 1 g amount of each of the following substances is dissolved in 1 L of water.

Which substance would give the solution a pH closest to 7?

A. NH_3

B. NaCl

C. H_2SO_4

D. NaOH

Question 16

When flaming items in aseptic procedures, it is best practice to place equipment and perform all procedures close to the flame in order to

A. reduce the hazards associated with the flame.

B. keep bacterial samples warm and therefore less likely to die.

C. perform tasks in a zone that minimises external contamination of samples and items.

D. create less clutter and therefore contribute to good occupational health and safety practices in the laboratory.

Question 17

A mole is a measure of

A. the number of particles in a substance.

B. the concentration of a solution.

C carbon atoms in a substance.

D. Avogadro's number.

Question 18

Inoculation loops are used to

A. take accurate aliquots of broth cultures for serial dilutions.

B. streak bacteria across the surface of an agar plate to separate cells.

C. spread bacteria over a nutrient agar plate evenly, as when making a lawn plate.

D. stab agar deeps to allow the growth of bacteria under the surface of the agar in anaerobic conditions.

Question 19

A solution of concentration (%V/V) is prepared by measuring

A. the volume of a liquid solute and adding solvent to a predetermined volume.

B. the volume of a liquid solvent and adding a predetermined mass of solvent.

C. the mass of a liquid solute and adding solvent to a predetermined volume.

D. the mass of a liquid solute and adding a predetermined mass of solvent.

Question 20

Streak plating in microbiological procedures is

A. rarely used in modern laboratories.

B. used only for fastidious microorganisms.

C. preferred over spread plating or pour plate preparations.

D. widely used to obtain single colonies derived from a single parent cell.

END OF SECTION A
TURN OVER

SECTION B – Short-answer questions

Instructions for Section B

Answer **all** questions in the spaces provided.

Question 1 (8 marks)

Transferring materials aseptically is a critical technique to avoid the contamination of samples, the laboratory environment and workers.

In the table below, write the eight main steps for the transfer of inoculum from one bacterial broth to another in the correct order.

	Step
1	
2	
3	
4	
5	
6	
7	
8	

Question 2 (5 marks)

Cleaning laboratory glassware and disposing of waste are important tasks in a laboratory.

Your supervisor has been called away and you are required to clean glassware with which you are unfamiliar.

a. Where would you find the correct procedure for cleaning the glassware? 1 mark

_____

b. Glassware is usually given a final rinse in distilled water rather than tap water.
Why might this be necessary? 2 marks

_____

_____

_____

c. Give a reason why many chemicals, such as organic solvents, are never disposed of down the sink. 2 marks

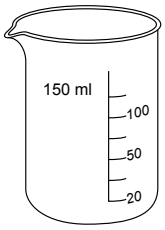
_____

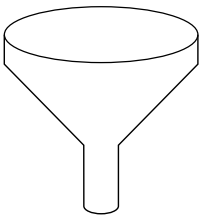
_____

_____

Question 3 (4 marks)

Identify each of the following pieces of glassware.





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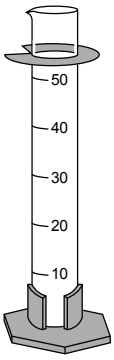
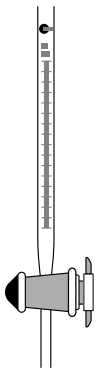




_____ _____

Question 4 (5 marks)

Provide appropriate disposal methods for the following items from a microbiological facility.

- scalpel, razor blades and syringe needles

- a beaker of 1% hypochlorite solution containing used microscope slides, cover slips, glass spreaders and an expensive glass cell counter

- a plastic biohazard waste bag containing used disposable gloves, blood, and other contaminated plastic tubes and caps, pipette tips, paper tissue and a re-usable glass culture bottle and cap

Question 5 (6 marks)

Fred is a technician in a university laboratory and he needs to prepare a buffer solution for the research staff. Following the laboratory's written procedures, he weighs out a measure of the chemical reagents for a buffer, dissolves them in water, adjusts the pH of the solution to the value specified, makes it to the required volume, and labels and stores it as directed.

His prepared buffer solution initially has a pH of 8.6, which needs to be adjusted to a pH of 6.8 according to the written procedure.

a. What is meant by the term 'pH'? 1 mark

b. Write the equation that relates pH to concentration. 2 marks

c. What solution would be appropriate to use to lower the pH? 1 mark

d. In what type of container should Fred's buffer solution be stored and where should it be stored? 2 marks

Question 6 (6 marks)

The Research and Development Manager at The Fizzy Drinks Company has been having some problems with the development of syrups for its Fiz-pop soft drink. The manager has been developing mixed sugar syrups that contain sucrose, glucose and other unspecified ingredients. She sent six samples of the soft drink to the laboratory for analysis, including for % w/v sucrose determination.

a. What accreditation would the laboratory need to have in order to undertake the testing? 1 mark

_____

b. Name a document that the laboratory should have to ensure the accuracy and repeatability of its tests. 1 mark

_____

c. Results for % w/v sucrose for the six samples from The Fizzy Drinks Company are shown below.

Analyser #1
Run number: 3
Date: 15/2/13
Time: 14:25
Operator: Poppie

Run number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
Values	0.01	2.04	29.98	31.33	30.62	19.87	50.88	52.15	51.95	50.54	45.49	45.46	45.59
Standard types	*BLK*	*Low CS*				*Med CS*				*High CS*	*PC*	*PC*	*PC*

i. A reagent blank (BLK) is in position 1.
How would you prepare this blank? 1 mark

_____

ii. Three standards (CS) are included in the run.
What are these standards testing? 1 mark

_____

iii. How could you tell if the three precision check samples (PC) are acceptably close in value? 1 mark

_____

d. If the Research and Development Manager at The Fizzy Drinks Company was unhappy with the results produced by the laboratory, what course of action might she take? 1 mark

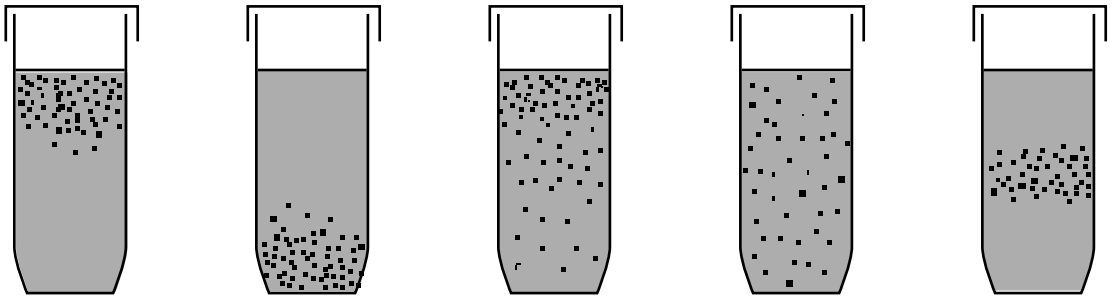
_____

Question 7 (7 marks)

Separation of microbial cells is often required to ensure pure cultures are obtained. Selective and enrichment methods are sometimes used for this: for example, in selective methods obligate **aerobes** only survive where there is air, obligate **anaerobes** only survive where there is no air, and facultative **aerobes** can survive in air and where there is no air.

a. Which three diagrams show the growth of obligate aerobes, facultative aerobes and obligate anaerobes? Write your answers in the boxes below. 3 marks

A. **B.** **C.** **D.** **E.**



☐ obligate aerobes

☐ facultative aerobes

☐ obligate anaerobes

b. What is the difference between selective and enrichment growth media? 2 marks

_____

_____

_____

c. Suggest **two** reasons why pure cultures are necessary in laboratory work. 2 marks

_____

_____

_____

Question 8 (2 marks)

A technician's workplace normally has weekly laboratory team meetings.

The supervisor would like to know why the technician has not been attending the weekly team meetings.

Give **two** reasons why the supervisor might be concerned.

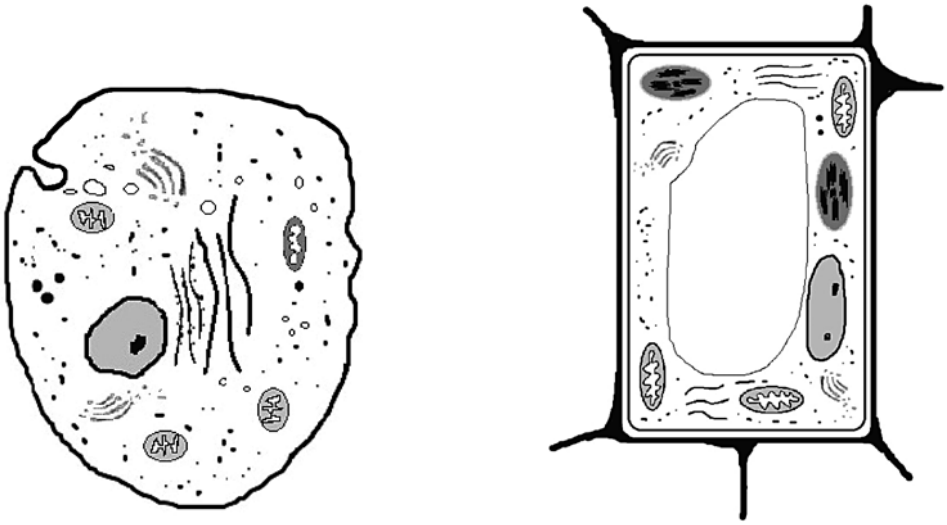
_____

_____

_____

Question 9 (3 marks)

Examine the cells below.



List three common structures and/or organelles found in both types of cell.

1. _____

2. _____

3. _____

Question 10 (10 marks)

Sodium hydroxide (NaOH) is a secondary standard solution that is commonly used in the laboratory. Since NaOH cannot be obtained in pure form, it must be titrated against a primary standard, such as hydrochloric acid (HCl), in order to obtain an accurate concentration. NaOH reacts quantitatively with HCl in equimolar amounts.

a. What is meant by the term 'equimolar'? 1 mark

b. What makes NaOH unsuitable to use as a primary standard? 1 mark

A technician titrated 0.150 M HCl with a 20.00 mL aliquot of NaOH and obtained the following results.

Titre number	Titre volume (mL)
1	17.35
2	16.80
3	17.30
4	18.00
5	17.40

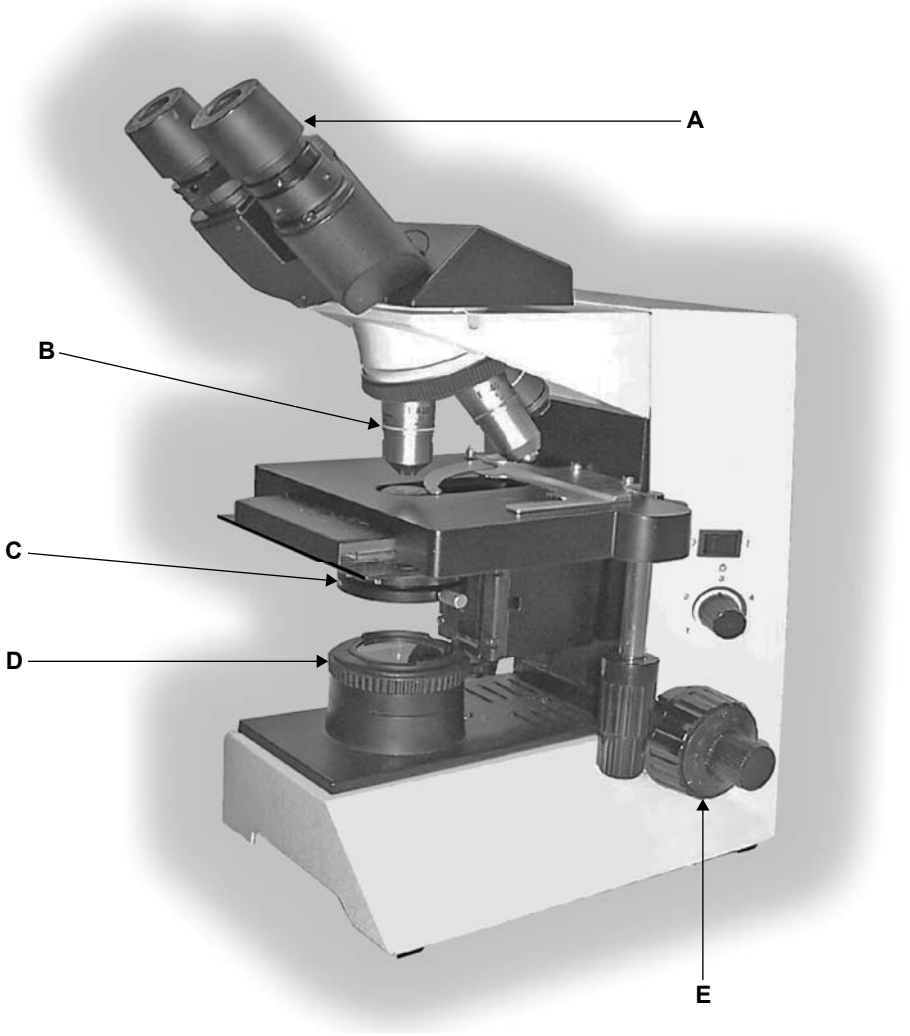
c. Give the **three** concordant titre values. 3 marks

d. What is an end point? 1 mark

e. Showing all calculations, determine the concentration of the NaOH. 4 marks

Question 11 (5 marks)

Use the image of the microscope to answer the following questions.



a. Complete the table below by giving the letters and names of the parts of the microscope that are used to **magnify** an image of a specimen. 2 marks

Letter	Name of part

b. Describe the function of the part labelled 'E'. 1 mark

_____

c. Give the letter and name of the part of the microscope that would be used to alter the amount of light coming through the stage. What is another function of this part? 2 marks

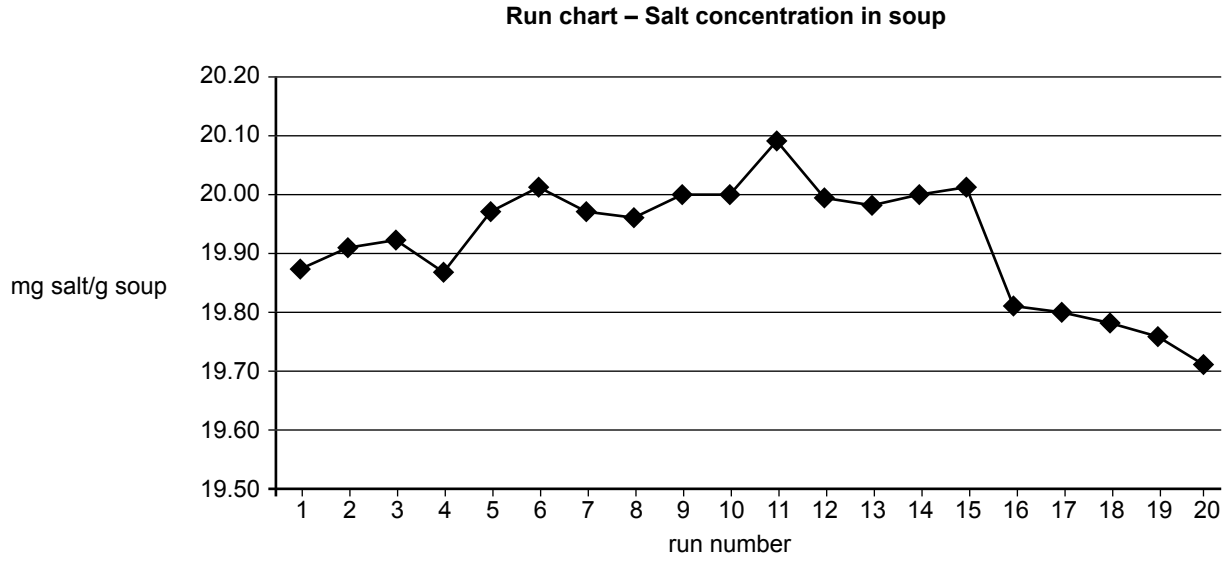
_____

_____

Question 12 (4 marks)

A food testing laboratory carries out an analysis of salt in canned soups. Technicians use a calibration standard to test the reliability of the machine used in the analysis. In the Standard Operating Procedure (SOP), the salt standard is recorded as 19.90 mg per gram of soup and the acceptable range is between 19.75 and 20.05 mg per gram of soup.

Examine the following run chart for this standard and answer the questions below.



a. Which runs, if any, fall outside the acceptable range? 1 mark

_____

b. Comment on any other areas of the run chart that could give cause for concern. 2 marks

_____

_____

c. How could the run chart be altered to make it easier to read? 1 mark

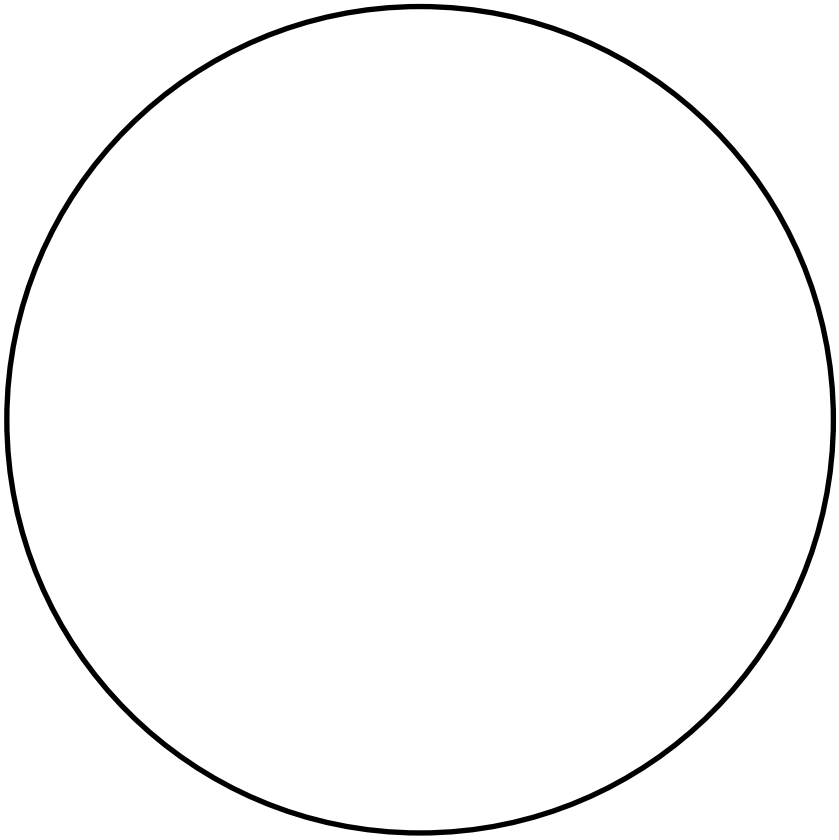
_____

_____

Question 13 (6 marks)

Kylee is a technician in a pathology laboratory. She is examining slides she has prepared from fresh human blood.

a. In the field of view below, draw **two** types of cell Kylee might expect to see. Include the correct labelling and magnification. 4 marks



field of view

b. List **two** safety precautions Kylee would need to take when preparing the slides. 2 marks

_____

_____

Question 14 (6 marks)

A laboratory technician has received a number of samples from a local quarry for analysis by microscopy.

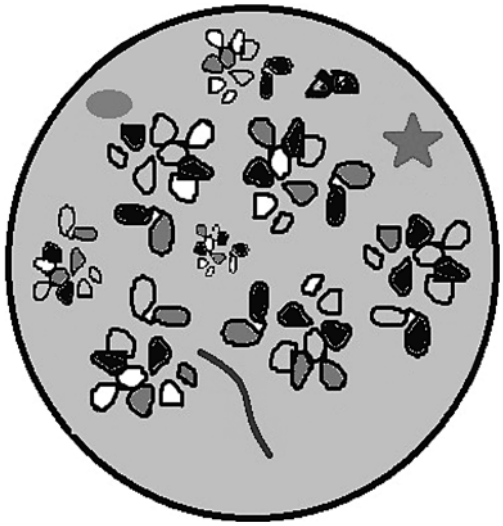
a. The samples are first logged into the laboratory's Laboratory Information Management System (LIMS).

List **three** pieces of information that might be recorded in the LIMS. 3 marks

b. Washed, finely ground rock samples or grains are observed under a microscope at low magnification and their features – including colour, texture, rounding, grain size and fractures – are described.

Describe a procedure for preparing and mounting the specimens on slides. 1 mark

c. Examine the image of a prepared slide below and describe the main features of the sample. Comment on any atypical results you observe. 2 marks



Question 15 (3 marks)
Identify **three** sustainable work practices that are applicable to a laboratory setting.

END OF QUESTION AND ANSWER BOOK