BITS, Pilani-Dubai Campus
Knowledge Village

II Year - II Semester 2003 - 2004
MT-1

COURSE NO.: TAUC211;   COURSE TITLE: Measurement Techniques-I;
TIME: 2 hrs.;   MARKS: 80   Date: 3rd June '04

EXAM NO. : _____Answering and Marking Scheme_____

NOTE: (Data provided are complete. Some questions might have more than one correct answer. Mark all the right choices. Please right only the final answer in the space provided below the questions. Working may be shown on the additional sheet provided.)

BIOLOGY

Each question carries 2 marks   Max. Marks:20

1. Label the following sketch of a typical compound lab microscope.
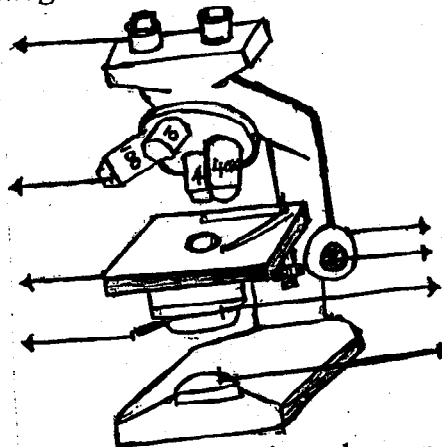
2. Resolving power of a microscope depends upon _____ and _____.

3. Absorbance readings during protein estimation were taken using the instrument _____ and at _____ wavelength.

4. Match the following most appropriately:(mark your answer within brackets)

   1.Anemia   A) Blood Typing ( )
   2.Erythrocytes   B) Lymphocytes   ( )
   3.Immunity   C) Neutrophils   ( )
   4.Phagocytosis   D) Hemoglobin   ( )

1

5. Sketch a representation of typical cell cycle and its phases.

6. Temporary increase in certain type of WBC during a particular disease state is known as_____, Example:_____.

7. Match the following most appropriately:(mark your answer within brackets)

   1.MethyleneBlue&Acetic acid   A) Biuret   ( )
   2.Copper   B) RBC   ( )
   3.Iron   C) WBC   ( )
   4.Hayem's Fluid   D) Hemoglobin ( )

8. If a man's blood group is B then he has _____ Antigen ,_____ Antibody and can only receive blood from_____.

9. Calculate Duration of Mitosis from the following data given the duration of cell cycle is 16 hrs.

   Ans:

STAGE	Nos.
Prophase	16
Metaphase	6
Anaphase	3
Telophase	1
Total No. Of Cells	220

10. A technician in a clinical lab diluted a blood sample to 20 times and counted 175 cells in four square grids of a neubauer chamber. What are the cells he was counting and give the total count along with the formula.

CHEMISTRY

11. The total conductance of one mole of sulphuric acid present in 1000 c.c. solution is its _____
    (a) specific conductance (b) equivalent conductanc
    (c) molar conductance (d) cubic conductance   (1)

12. A salt X is dissolved in distilled water, the resulting solution is acidic, the salt is made up of
    (a) strong acid & strong base
    (b) weak acid & weak base
    (c) strong acid & weak base
    (d) weak acid & strong base   (1)

13. For a chemical change, A→B. It is found that the rate of reaction triples when the concentration is increased nine times. The order of the reaction is:
    (a) Half   (b) One   (c) Two   (d) Three   (1)

14. The pH at the stoichiometric point of the hypochlorous acid Vs sodium hydroxide titration is due to the presence of _____ ions.   (1)

15. Molisch's test detects the presence of _____ group in Carbohydrates. (1)

16. The pH at the half way to stoichiometric point of the titration between a strong base & weak acid is 4.5. Calculate its ionization constant?   (1)

17. Write the balanced chemical equation for the preparation of acetanilide   (1)

18. Name the acidic and the basic center of the reaction between aniline and acetyl chloride in acetic acid medium.　(1)

19. Suggest the role of glacial acetic acid & zinc dust in the preparation of acetanilide.　(1)

20. What happens when sodium bicarbonate solution is added to succinic acid? Write the balanced chemical equation.　(1)

21. Why carboxylic acids are more acidic than corresponding alcohols?　(1)

22. Why is acidic medium (sulphuric acid) required for the titration of potassium permanganate and ferrous sulphate? Can HCl be used instead? (1)

23. The degree of dissociation of a weak monobasic acid is 8×10^{-3}. Calculate the dissociation constant of its 0.5 M aqueous solution? (2)

24. Which compound is responsible for the red color for the fehling test of reducing sugar? Write the relevant chemical equation. (1)

25. Balance the following redox equation in acidic medium
$$Mn^{2+} + PbO_2 \rightarrow MnO_4^- + Pb^{2+}$$
(2)

26. For the reaction, A + B → products

Initial conc. mol/l [A]	Initial conc. mol/l [B]	Initial rate of formation of products (mol/l/s)
0.1	0.1	0.2
0.2	0.1	0.4
0.3	0.1	0.6
0.3	0.2	2.4
0.3	0.3	5.4

(a) Give the rate law equations for this reaction using the data in the table above.

(b) What is the overall order of reaction?

(c) Calculate the value of rate constant, showing the unit.

(3)

PHYSICS

Possibly for use

$\{c = 2.998 \times 10^8 \text{ m·s}^{-1}$; $\quad \mu_0 = 4\pi \times 10^{-7} \text{ N A}^{-2}$; $\quad \varepsilon_0 = 8.85 \times 10^{-12} \text{ F·m}^{-1}$;

$h = 6.63 \times 10^{-34} \text{ J·s}$; $e = 1.602 \times 10^{-19} \text{ C}$; $m_e = 9.1 \times 10^{-31} \text{ kg}$; $m_p = 1.67 \times 10^{-27} \text{ kg}\}$

27. A box rests on a frozen pond, which serves as a frictionless horizontal surface, if a fisherman applies a horizontal force with magnitude 48.0 N to the box and produces an acceleration of magnitude 3.00m/s². What is the mass of the box? [2]

28. The current developed in a thermopile when it is exposed to light from a lamp is due to [1]

      i.   only heat from the source

      ii. heat and light from the source

      iii. only light from the source

      iv. none of the above.

29. An ultraviolet light bulb, emitting at 400nm, and an infrared light bulb, emitting at 700nm, each are rated at 130W. Which bulb would cause more photoelectric current? Why? [1]

30. In the following Figure please indicate under which condition do you get the respective plot for ' Characteristics of a solar cell'? [1]


a)

b)

c)

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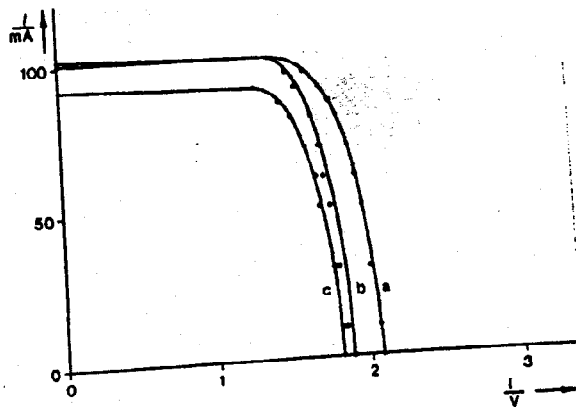
31. An atom is excited to an energy level E_1 from its ground state energy level E_0.
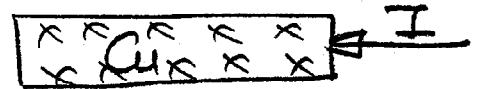
The wavelength of the radiation emitted as [1]

    i. $(E_0-E_1) / hc$

    ii. $(E_1-E_0) / h$

    iii. $hc / (E_1-E_0)$.

    iv. $(E_1 / hc) - (E_0 / hc)$.

    v. $h / (E_1-E_0)$

32. Plot a graph to depict the dependence of Hall voltage (V_H) on applied magnetic field (B) as you have experimentally observed. [1]

33. In the following figure, specify the higher potential of Hall voltage set in the two specimens. X - direction of B [2]
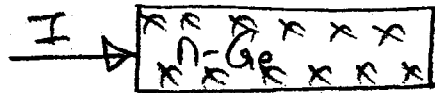
i)   ii)

34. Draw the circuit diagram of parallel RLC circuit for measuring current. Plot the graphs showing the dependence of voltage resonance on damping resistance. [2]

35. How can you calculate the Q-factor from the plots you have drawn above? [1]

36. A table tennis ball is thrown at a stationary bowling ball. The table-tennis ball makes a one-dimensional elastic collision and bounces back along the same line. After the collision, compared to the bowling ball, the table-tennis ball has [1]

    i. A larger magnitude of momentum and more kinetic energy

    ii. A smaller magnitude of momentum and more kinetic energy

    iii. A larger magnitude of momentum and less kinetic energy

    iv. A smaller magnitude of momentum and less kinetic energy

   v. The same magnitude of momentum and the same kinetic energy.

37. The hydrogen spectrum has a red line at 656 nm and a blue line at 434 nm. What is the angular separation between the first order spectral lines obtained with diffraction grating that has 4500 lines/cm? [2]

38. An electron has a de-Broglie wavelength of 2.80×10^{-10} m. Determine (a) the magnitude of the momentum (b) its kinetic energy [3]

39. When white light is incident on a diffraction grating, the light that will be deviated the maximum from central image will be [1]

    i. Yellow

    ii. Violet

    iii. Indigo

    iv. Red

40. A positive ion is projected in a direction perpendicular to a uniform magnetic field with velocity 'v' (as shown in the figure below). How will its motion be affected? [1]
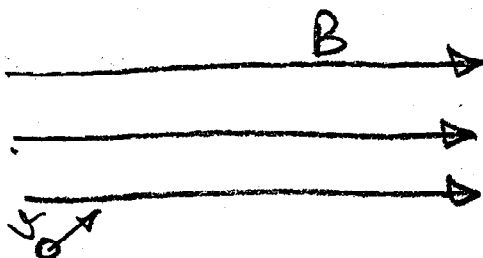
41. How much magnetic field and current is required to make a proton move in a radius of 5 cm in a region between two Helmholt coils of radius 0.2 m and 200 turns? [3]

42. Suppose that a laser produces green light instead of the red light produced by the He-Ne laser. Are the photons emitted by this laser [1]

    i. more energetic

    ii. less energetic

    iii. of equal energy

as compared to those emitted by He-Ne laser?

43. In laser diffraction experiment instead of 632.8 nm wavelength (red color) if we use a wavelength of 800.0 nm, what pattern should we expect to see on the screen? [1]

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44. A light with frequency well above the cutoff frequency is incident on the emitter in a photoelectric-effect apparatus. The frequency of the light is then doubled while the intensity is kept constant. [2]

(a) How does this affect the stopping potential?

    i. The stopping potential would increase

    ii. The stopping potential would increase

    iii. The stopping potential will remain the same.

(b) How does this affect the photoelectric current?

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i.   The photoelectric current will increase.

ii. The photoelectric current will decrease

iii. The photoelectric current will remain the same.

45. An inductor has an inductance L_0. A second inductor is identical to the first except that it is twice as large, in length as well as in diameter. What is the ratio of the inductance of the magnified inductor to the original inductor?   [2]

46. Which of the following changes will increase the frequency of an LC oscillator? (There may be more than one correct answer)   [1]

    i.   Inserting a dielectric slab into the capacitor

    ii. Inserting a paramagnetic substance into the inductor.

    iii. Inserting a ferromagnetic substance into the inductor.

    iv. Inserting a diamagnetic substance into the inductor.

47. Electrons accelerated at 7.5 kV are made incident on a crystal. If first order diffraction is observed at Bragg angle 3.4°, calculate the lattice constant.   [2]

48. In the experiment of Fine Structure of one-electron spectrum, why do we get a line spectrum and not continuous band spectrum like the one in Planck's constant experiment.   [2]

_____

_____

_____

49. In the fine structure of the sodium spectrum, the doublet arises due to interaction between which two quantum numbers of the electrons?   [1]

_____

50. What are the units for magnetization $\vec{B}$?   [1]

    i.   T

    ii. T/m3

    iii. C/m.s

iv. C.m/s

51. Define Coercive field. Draw a Hysteresis loop showing the remanence and coercive field. [2]

_____

_____

52. In the experiment, Vibrations of strings, which mode of vibration do we measure? Why? (Answer in one line) [1]

_____

53. When standing wave is set up on a string fixed at both ends [1]

    i. the number of nodes is equal to the number of antinodes

    ii. the wavelength is equal to the length of the string divided by an integer

    iii. the frequency is equal to the number of nodes times the fundamental frequency

   iv. the shape of the string at any time is symmetric about the midpoint of the string

BITS, PILANI – DUBAI CAMPUS, KNOWLEDGE VILLAGE, DUBAI
SECOND SEMESTER 2003 – 2004
TA UC 222 MEASUREMENT TECHNIQUES – 2 TEST 2 (OPEN BOOK)
Date: 23/05/04
DURATION: 50 MINUTES
WEIGHTAGE: 20%
MAXIMUM MARKS: 20

1. With the help of examples, differentiate between primary and secondary methods of measuring flow rates. **[2M]**

2. "When it is required to measure point velocities of air flowing through a tube, the pressure-measuring device should have a high sensitivity." Explain the reason.

   A pitot static tube is fitted at the nose of an airplane. A u – tube water manometer connected to it shows a deflection of 10cm of water. Find the velocity of the airplane. Take the density of air to be 1.2 kg/m³. **[2M]**

3. In a certain laboratory experiment, water is passing over a flat plate of dimensions 1m x 2m. The flat plate is being heated by sending 10 amperes current to the resistive element embedded in the plate. The current is supplied from a 240volts source. Temperature of surface is measured to be 140°C where as free stream temperature of the fluid is 30°C. Calculate the convective heat transfer coefficient. **[2M]**

4. "Thermal conductivity is a property of the material and Convective heat transfer coefficient is not a property of the material." Do you agree with this statement? Justify your answer. **[2M]**

5. Refer figure, which shows a vegetation map. Explain various methods that can be used to find the total area of vegetation. **[2M]**

Area representing the vegetation

Area where there is no vegetation.
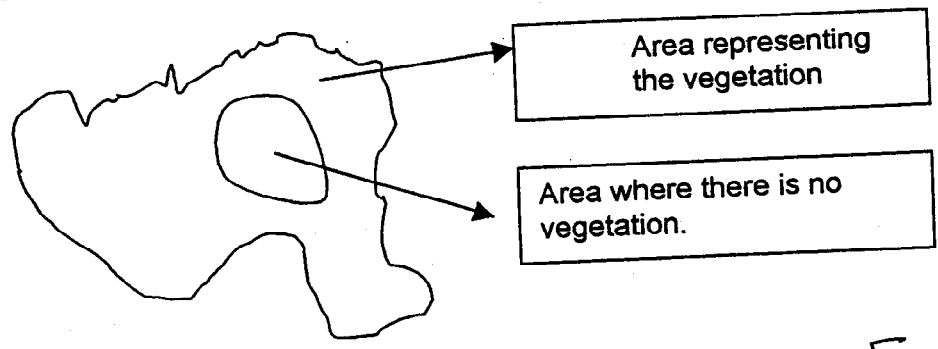
[PTO]

6. Find the current through the detector in the circuit given below. Assume that the detector has a resistance of 100 Ω and the battery has a negligible internal resistance.[3M]
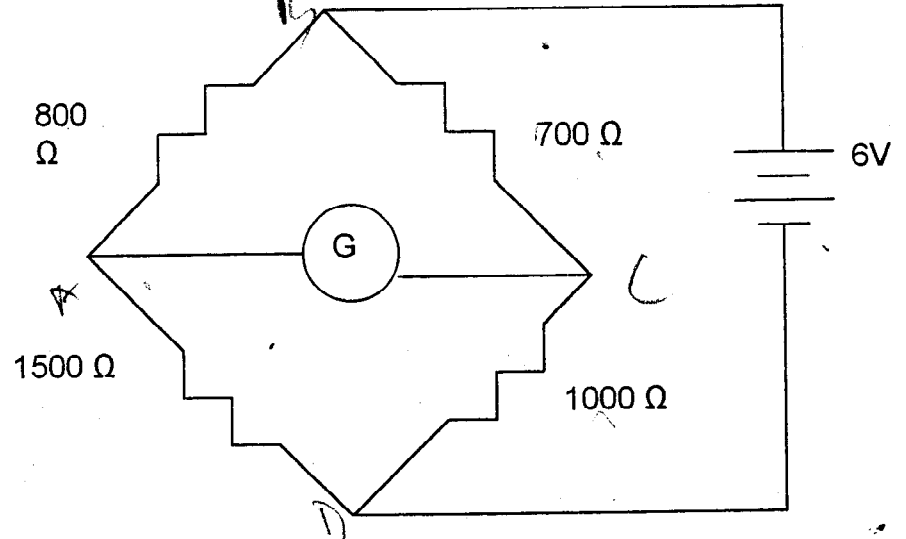
7. Name two substances that experience a reduction in resistance upon the exposure to light. Where do these materials find their application?   [1M+1M]

8. What are the factors that affect the resolution and linearity of the variable resistance transducer?   [2M]

9. What do you understand by the following terms? Explain.   [3M]

(i) Loading Effect.
(ii) Time base generator.