

BITS,PILANI- DUBAI CAMPUS

Knowledge Village, Dubai

Year II – Semester I 2006– 2007

TEST II (Closed Book)

Course No: TA UC 222

Course Title: MEASUREMENT TECHNIQUES II

Date: 17/12/06 50 Minutes M.M = 20(10%)

ANSWER ALL THE QUESTIONS

1. a. A first order system is subjected to a harmonic input of 4Hz. The system has a time constant of 0.7sec. Calculate the decrease in amplitude response and the phase lag.
b. A thermometer acting as a first order system is initially at a temperature of 25° C and is then suddenly subjected to a temperature of 100° C. After 8sec the thermometer indicates a temperature of 60° C. Calculate the time constant and the 90 percent rise time for the thermometer. [2 + 2 Marks]

 2. A first order system has a phase shift of -50° at a certain frequency. What will be the phase lag at a frequency of twice of this value? What will be the relative amplitude responses at the two frequencies? [4 Marks]

 3. a. Why filamentary suspension is used in D'Arsonal instrument?
b. Define hysteresis.
c. Which device is used for ac or dc voltage measurement of potential above 100V?
d. What is fixed error? [4 Marks]

 4. . Explain the principle of piezo electric effect. What are the applications of it? [3 Marks]

 5. a. A certain resistor draws 110.2V and 5.3A. The uncertainties in the measurements are $\pm 0.2V$ and $\pm 0.06V$ respectively. Calculate the power dissipated in the resistor and the uncertainty in the power. [3 Marks]
b. Explain the working principle of thermocouple meter. [2 Marks]
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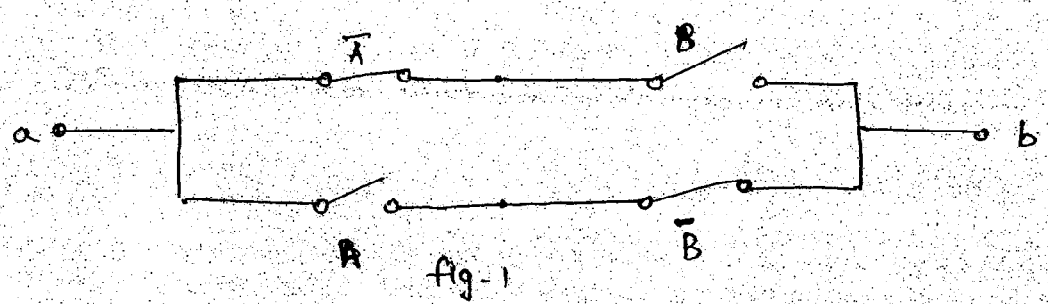
6. Coefficient of discharge is applicable for []
a. Orifice meter and manometer
b. Manometer and pressure gauges
c. Orifice meters
d. Only pressure gauges
7. In orifice meter, the pressure at a point immediately after the sharp edge is []
a. Less than that at the entrance of the pipe
b. Greater than that at the entrance of the pipe
c. Equal to that at the entrance of the pipe
d. Independent of the rate of flow
8. The rotameter is _____ flow meter and is essentially installed in _____ pipe line []
a. Variable area, vertical
b. Constant area, vertical
c. Variable area, horizontal
d. Variable area, inclined
9. Small pressure changes in gas flows can be measured accurately by []
a. U-tube manometer
b. Single column manometer
c. Compound U-tube manometer
d. Reservoir manometer
10. In your experiment to find heat transfer coefficient, the thermal conductivity that you use is for _____ []
a. Water
b. Specimen
c. air
d. none of the above
11. In your experiment to calibrate liquid rotameter, _____ pump used to supply water to rotameter. []
a. Reciprocating
b. Rotary
c. Centrifugal
d. Vane

12. In your experiment to calibrate gas rotameter, the range of rotameter is _____ [_____]
- $0.5 - 5.0 \text{ mm}^3/\text{hr}$
 - $0.5 - 5.0 \text{ m}^3/\text{hr}$
 - $0.5 - 5.0 \text{ cm}^3/\text{hr}$
 - None of these
13. Which of the following devices operate on the same principle as orifice meter. [_____]
- Pitot tube
 - Rotameter
 - Turbine flowmeter
 - Manometer
14. If the cross sectional areas of two test points in a Bernoulli test apparatus are $A_1 = 6.1575 \text{ cm}^2$, $A_2 = 1.539 \text{ cm}^2$, then the ratio velocity heads (V_2/V_1) is _____ [_____]
- 4.00
 - 0.24
 - 0.05
 - 16.00
15. In a heat transfer test on 1 m^3 volume of water, the temperature of water decreases from 70°C to 65°C in 5 minutes. The approximate heat transfer rate is _____ (Specific heat of water = 4.187 kJ/kgK) [_____]
- 6.978 kW
 - 697.8 kW
 - 69.78 kW
 - None of these
16. An orifice meter has been fitted into a pipe line of internal diameter D for measuring flow rate through it. The location of pressure tapping downstream of meter should be at a distance of _____ from the position of orifice. [_____]
- $0.75 D$
 - $0.50 D$
 - $0.25 D$
 - $1.00 D$
17. One atmospheric pressure is equivalent to _____ of water column [_____]
- 10336 mm
 - 10336 cm
 - 10336 m
 - None of these

18. Which of the following parameters is not useful in calculating heat transfer coefficient in your transient heat conduction experiment. []
- Volume to surface area ratio of the specimen
 - Temperature of water
 - Temperature of specimen
 - None of these
19. In Osborne Reynolds apparatus, the average velocity of water in the pipe of cross sectional area 10 cm^2 , and flowing at a rate of 1 liter per minute is _____ []
- $10 \text{ m}^3/\text{min}$
 - $1 \text{ m}^3/\text{min}$
 - $100 \text{ m}^3/\text{min}$
 - None of these
20. The density of rotameter bob material is _____ the density of fluid. []
- Equal to
 - Less than
 - Greater than
 - Less than or equal to
21. In an LVDT converts []
- Electrical to Mechanical
 - Mechanical to Electrical
 - Electrical to Rotational
 - None of the above
22. The position for which the output is zero on the CRO is known as []
- Null point
 - Break point
 - Quiescent point
 - Operating point
23. In an inverting amplifier, the output []
- is 180° out of phase with reference to the input
 - is in phase with the input
 - is 90° out of phase with reference to the input
 - None of the above
24. The gain of a non-inverting amplifier is given by []
- 1
 - R_f / R_{in}
 - $1 + (R_f / R_{in})$
 - 0

25. A full wave rectifier []
- a. Rectifies all of AC to DC
 - b. Rectifies Half of AC to DC
 - c. Does not rectify at all
 - d. Rectifies DC to AC
26. A Junction diode []
- a. Shows linear variation of current with voltage
 - b. Shows non-linear variation of current with voltage
 - c. Shows constant voltage for all currents
 - d. None of the above
27. While loading the transformer load resistances are added in []
- a. Parallel
 - b. Series
 - c. Mixed
 - d. None of the above.
28. To measure accurate power from un-balanced loads []
- a. Single wattmeter method
 - b. Two wattmeter method
 - c. Power factor meter method
 - d. None of the above.
29. AC Meters will read []
- a. Peak to Peak value
 - b. RMS value
 - c. Average Value
 - d. Mean Value
30. In an iron core transformer the voltage ratio is 8. What will be the turn's ratio? []
- a. 8
 - b. 16
 - c. 4
 - d. None of the above
31. In transformer, iron loss is found through []
- a. Load Test
 - b. No Load Test
 - c. SC test
 - d. None of the above

32. Single phase induction motor is not self starting motor. []
- True
 - False
33. While starting d.c motor []
- Field rheostat should be at minimum and armature should be at minimum
 - Field rheostat should be at maximum and armature should be at minimum
 - Field rheostat should be at maximum and armature should be at maximum
 - Field rheostat should be at minimum and armature should be at maximum
34. In an electrical circuit ammeters should be connected in and voltmeters to be connected in []
- Parallel, Series
 - Series, Series
 - Series, Parallel
 - Parallel, Parallel
35. When the NPN transistor is operating in the active region and in common emitter configuration []
- Base Emitter is reverse biased and Collector Emitter is reverse biased
 - Base Emitter is forward biased and Collector Emitter is reverse biased
 - Base Emitter is reverse biased and Collector Emitter is forward biased
 - Base Emitter is forward biased and Collector Emitter is reverse biased
36. The voltage peak to peak from CRO reading is 8. Then V_{rms} is []
- 2.21
 - 1.414
 - 2.828
 - 3.8
37. This is a realization of ----- operation. []
- (fig-1)
- NOT
 - NAND
 - EX-OR
 - NOR



38. The filter that has the least ripple factor is []

- a. L section filter
- b. Π section filter
- c. Power supply with no filter
- d. C filter

39. The Universal gates are []

- a. NAND and NOR
- b. EX-OR and OR
- c. AND and OR
- d. OR and NOT

40. If the time period of the signal 1 millisecond then the frequency of the signal is []

- a. 100 Hz
- b. 2000 Hz
- c. 1000 Hz
- d. 10 KHz

**BITS, Pilani-Dubai Campus
Knowledge Village**

**II Year - I Semester 2006 - 2007
MT-1**

COURSE NO.: TAUC211; COURSE TITLE: Measurement Techniques-I;
TIME: 2 hrs; WEIGHTAGE: 40% Date: 19th DEC'06

Question paper contains 12 pages.

I.D. No. _____

NAME: _____

Sec No:

RECHECK REQUEST:

PHYSICS

NOTE: Answer all the 24 questions. First 20 questions carry 3 marks and last 4 questions carry 5 mark. Write the correct answer in a separate answer sheet attached with the question paper.

$$\{c = 2.998 \times 10^8 \text{ m}\cdot\text{s}^{-1}; \quad \mu_0 = 4\pi \times 10^{-7} \text{ N A}^{-2}; \quad \epsilon_0 = 8.85 \times 10^{-12} \text{ F}\cdot\text{m}^{-1};$$

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

e/m ratio

1. If the connections to the Helmholtz coil is reversed you would observe the electron beam to
 - a) Remain unaffected
 - b) Move in a spiral path
 - c) Bend in the opposite direction
 - d) Move in a helical
2. In order to separate elementary particles it is important to know
 - a) Only charge
 - b) Only mass
 - c) Only specific charge
 - d) All the above

Electron Diffraction

3. The De broglie wavelength of an electron moving at $3 \times 10^6 \text{ m/s}$ ($h = 6.6 \times 10^{-34} \text{ Js}$, $m = 9.1 \times 10^{-31} \text{ Kg}$) is
 - a) 2.4×10^{-10}
 - b) 1.1×10^{-6}
 - c) 0.5×10^2
 - d) 3×10^8
4. Electron shows both particle and wave properties because
 - a). Electromagnetic waves can be reflected and diffracted by crystals
 - b). Electrons waves can be excited from a surface.
 - c). Electrons have mass and move in a circular path in magnetic fields
 - d). Electrons have mass and can be diffracted by crystals.

Solar Cell

5. The current developed in a solar cell when it is exposed to light from a lamp is due to
 - a). only heat from the source
 - b). heat and light from the source
 - c). only light from the source
 - d). none of the above.
6. Which of the following does not give p-type properties to silicon when used as doping agent?
 - a) Aluminum
 - b) Boron
 - c) Antimony
 - d) Gallium

Planck's Constant

7. In a particular reading in Planck's constant the higher value of voltage shows
 - a). frequency of incident light is high
 - b). frequency of incident light is low
 - c). Intensity of the incident light is high
 - d). A bulb of higher wattage is used.
8. The frequency of the light falling on a given photoelectric material must be greater than a certain frequency f_0 , called cut off frequency. The f_0 depends only on
 - a) frequency of incident light
 - b) wavelength of incident light
 - c) Intensity of incident light
 - d) Photoelectric material

Vibration of Strings

9. Two wires A and B are have identical dimensions and are made of two materials (density of A is greater than the density of B) are vibrating with the same frequency under same tension. The wavelength of the standing waves on A will be
 - a). smaller than those on B
 - b). greater than those on B
 - c). same as those on B
 - d). cannot be specified
10. A string of length 1 m is pulled by a force of 40 N . What will be its lowest frequency of vibration ? ($\rho = 8.8 \text{ g/cm}^3$, $r = 0.2 \text{ mm}$).
 - a) 95.2
 - b) 45
 - c) 23
 - d) 11

Elastic Collision

11. If a moving car X collides head on with a moving car Y in the opposite direction, the conservation of momentum states
 - a) the final momentum of X = the final momentum of Y
 - b) the total momentum of X and Y is reversed by the collision
 - c) the total momentum of X and Y stays constant
 - d) the initial and final momentum of X is the same
12. A body of mass 'm' moving with a constant velocity 'v' hits another body of the same mass moving with the same velocity 'v' but in the opposite direction and sticks to it. The velocity of the compound body after collision is
 - a) 'v'
 - b) 2v
 - c) zero
 - d) v/2

Fine Structure

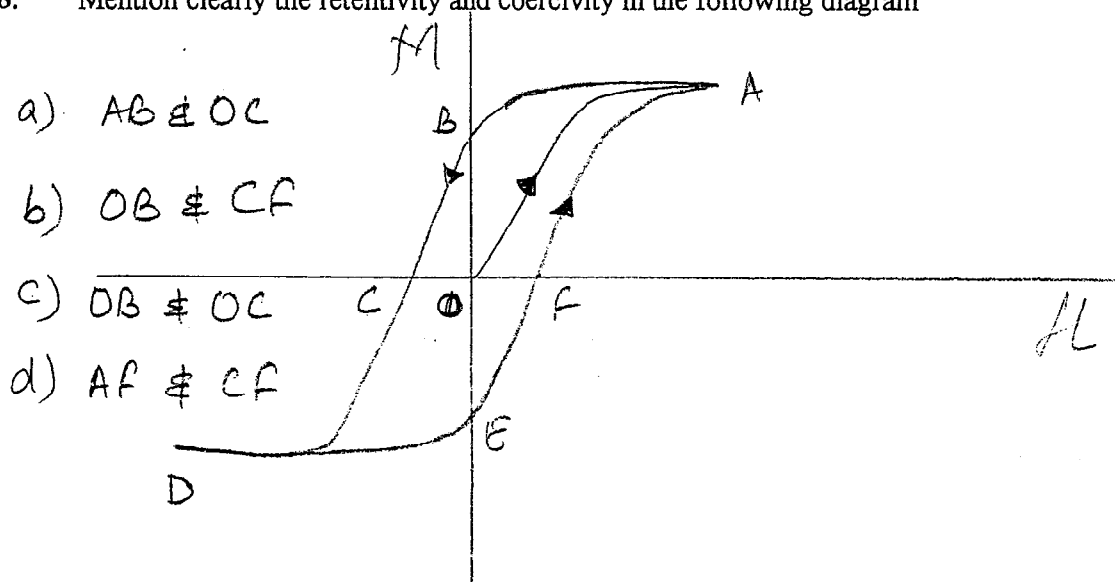
13. An atom is excited to an energy level E_1 from its ground state energy level E_0 . The wavelength of the radiation emitted as
- a). $(E_0 - E_1) / hc$
 - b). $(E_1 - E_0) / h$
 - c). $hc / (E_1 - E_0)$
 - d). $(E_1 / hc) - (E_0 / hc)$
14. A light of wavelength 600nm falls on a grating having 600 ruling/mm. The first minima will be observed approximately at an angle of (in degrees)
- a) 4.3
 - b) 10.22
 - c) 22
 - d) 38.5

Single and Double Slit

15. In a double slit experiment, if the slit width is reduced by half, then the separation between two maxima will
- a) remain the same
 - b) decrease by two times
 - c) increase by two times
 - d) Increase by four times
16. The diffraction pattern of a single slit is observed with green light. The green light is then replaced by red light. Which of the following changes will allow the location of the diffraction minima on the screen to remain unaffected by the change of light color?
- (a) Increase the width of the slit.
 - (b) Decrease the width of the slit.
 - (c) Move the screen away from the slit.
 - (d) Increase the intensity of the light source.

Ferromagnetic Hysteresis

17. Which type of substance retains magnetism?
- (a) Paramagnetic;
 - (b) Diamagnetic;
 - (c) Ferromagnetic;
 - (d) Paramagnetic and ferromagnetic substances tend to be about the same;
18. Mention clearly the retentivity and coercivity in the following diagram



RLC Circuit

19. In the plot of Voltage (V) and frequency of a parallel tuned circuit, the frequency corresponding to the peak value of V is
 (a) the maximum Q value
 (b) the natural frequency of the circuit
 (c) minimum Q value
 (d) maximum frequency of external source
20. In the series tuned circuit of RLC, if V is the voltage across the resistor and I is the current flowing through the resistor, then
 a) V and I is minimum at resonance
 b) V is maximum and I is minimum at resonance
 c) V is minimum and I is maximum at resonance
 d) V and I both are maximum at resonance

Hall effect

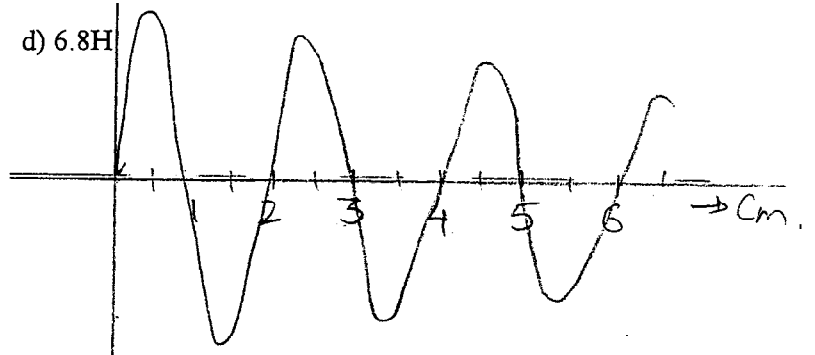
21. Of the three vectors in the equation $\vec{F}_B = q\vec{v} \times \vec{B}$, which pair(s) are always at right angles?
 (a) \vec{F}_B and \vec{v} ; (b) \vec{v} and \vec{B} ; (c) \vec{B} and \vec{F}_B ;
 (d) None; (e) All three must be at right angles.

22. A proton traveling at 23° with respect to the magnetic field of strength 2.63mT experiences a magnetic force of 6.48×10^{-17} N. The speed of the proton will be
 a) 3.94×10^5 m/s b) 1.2 m/s c) 8.9×10^3 m/s d) 15.3×10^{-3} m/s

Induction of solenoids

23. Calculate the inductance for a coil, which when connected to a capacitor of capacitance 5nf, produces the following sinusoidal wave on the CRO(having 0.5ms/division along the x-axis)
 a) 0.2026H b) 1.2mH c) 4.5mH d) 6.8H

1 div = $\frac{0.5 \text{ cm}}{4}$



24. An inductor has an inductance L_0 . A second inductor is identical except that it has double the radius and double the number of windings. What is the ratio of the inductance of the second inductor to the original inductor?
 (a) 4; (b) 2; (c) 1; (d) $\frac{1}{2}$;

Name:

Id.No:

MT-1(Chemistry)

- 1.(i) Carboxylic acids have higher boiling point than alcohols of comparable molecular mass – Why? (2M)
- (ii) Write the IUPAC name of $\text{HOOC} - \text{CH}_2 - \text{COOH}$ (1M)
- (iii) Which of the following does not form anhydride?
(a) acetic acid (b) n-butyric acid (c) propionic acid
(d) formic acid (1M)
- (iv) Fehling 'A' consists of an aqueous solution of _____ while Fehling 'B' consists of an alkaline solution of _____ (1M)
- (v) Which of the following is an example of aldohexose?
(a) Ribose (b) Fructose (c) sucrose (d) Glucose (1M)
- (vi) Name the polysaccharide which represents the polymeric structure of β -D- glucose units. (1M)
- 2.(i) Why the reaction rate changes with passage of time? (1M)
- (ii) For a chemical reaction
 $\text{X} + 2\text{Y} \xrightarrow{\text{fast}} \text{Z}$, if the rate of appearance of Z is 0.50 moles per liter per hour then the rate of disappearance of Y is
(a) $0.5 \text{ mol L}^{-1}\text{hr}^{-1}$ (c) $1.0 \text{ mol L}^{-1}\text{hr}^{-1}$
(b) $0.25 \text{ mol L}^{-1}\text{hr}^{-1}$ (d) can not be predicted. (1M)

(iii) For a chemical reaction $A \longrightarrow B$, it is found that the rate of reaction doubles when the concentration of A is increased four times. The order of the reaction with respect to 'A' is

- (a) 2 (b) 1 (c) zero (d) $\frac{1}{2}$ (1M)

(iv) If the decomposition of nitrogen(V) oxide

$2N_2O_5 \longrightarrow 4NO_2 + O_2$ following a first order kinetics, calculate the rate constant for a 0.04M solution, if the instantaneous rate is $1.4 \times 10^{-6} \text{ mol L}^{-1} \text{ s}^{-1}$ (2M)

(v) Hydrolysis of ethyl acetate in an acidic solution is an example of _____ order. (1M)

(vi) The sum of powers to which the concentration terms are raised in the rate law is called _____ of the reaction. (1M)

3(i). The conductance offered by 0.25M acetic acid solution having specific conductance $1.5 \times 10^{-3} \text{ mhos cm}^{-1}$ (cell constant = 0.09 cm^{-1})

- a. 1.67mhos b. 0.0167mhos c. 1.62mhos d. 1.72mhos (1M)

(ii). The molar conductance of 1M CH_3COOH is _____ if the specific conductance is $0.015 \text{ cm}^{-1} \text{ mhos}$ (1M)

(iii). On dilution the molar conductance of a weak electrolyte

- a. decreases b. increases c. makes no change d. reaches 0 value (1M)

(iv). Sketch the molar conductance of strong and weak electrolytes with concentration (2M)

(v). Calculate λ and α of 0.1M acetic acid (cell constant = 0.9 cm^{-1} ; specific conductance = $1.5 \times 10^{-3} \text{ mhos cm}^{-1}$)

(2M)

4(i) The pH of $2.0 \times 10^{-3} \text{ M HCl}$ solution is -----

(1M)

(ii). Henderson- Hasselbach equation is

(1M)

a. $\text{pH} = \text{pKa} - \log \frac{[\text{acid}]}{[\text{base}]}$

b. $\text{pH} = \text{pKa} + \log \frac{[\text{acid}]}{[\text{base}]}$

c. $\text{pKa} = \text{pH} + \log \frac{[\text{acid}]}{[\text{base}]}$

d. $\text{pKa} = \text{pH} - \log \frac{[\text{acid}]}{[\text{base}]}$

(iii). The pH at the stoichiometric point of weak base versus strong acid titration is

(1M)

a. $\text{pH} > 7$ b. $\text{pH} < 7$ c. $\text{pH} = 7$ d. $\text{pH} = 10$

(iv). Write any 3 advantages of pH titration

(3M)

(v) The colour change with the universal indicator for $\text{pH} = 4$ is

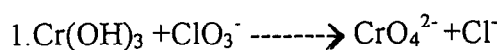
(1M)

a. red b. orange c. yellow d. green e. blue

- 5(i). The indicator used in the redox reaction between FeSO_4 and KMnO_4 is (1M)
a. phenolphthalein b. methyl orange c. thymol blue d. methyl red e. none
- (ii). The molar concentration of a solution containing 2.5 g FeSO_4 in 250ml water (1M)
is----- (M.Wt. of $\text{FeSO}_4 = 278$)

- (iii). Calculate the equivalent mass of KMnO_4 in three different condition (2M)
a. acidic
b. basic
c. neutral

- (iv). Balance the following chemical reaction (2M)



- (v). The standard electrode potential of Cu_2^+ , $\text{Cu} = +0.340\text{V}$ and Zn^{2+} , $\text{Zn} = -0.76\text{V}$
which ion will undergo oxidation and which will undergo reduction? (1M)

6. (i) IUPAC name of aniline is _____ (1M)

- (ii) What happens if you use excess of acetic anhydride, during the synthesis of acetanilide? Represent it by chemical equation? (3M)

(iii) What are the products obtained when aniline is heated with CH_3I under pressure (1M)

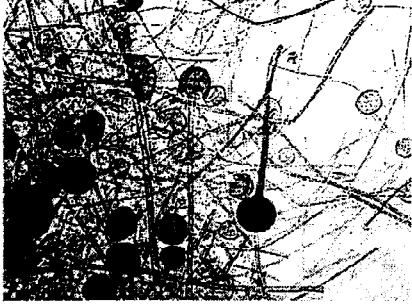
(iv) Write the reaction products of aniline and acetyl chloride. (1M)

MEASUREMENT TECHNIQUES – 1 [BIOLOGY]

NAME OF THE CANDIDATE: _____ ID NO: _____

1) Identify the structure and label it.

(0.254X=1)



2) Name five major components to the UV-Vis. spectrophotometer.

(0.25X5=1.25)

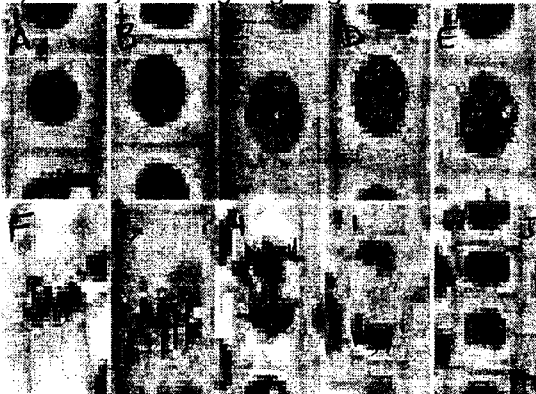
3) Why during Spectrophotometric analysis that you have done in the class, the colour of the solution turns blue. (0.5)

4) Which part of the cell generally takes up the dye used for staining? (0.5)

5) Write the formula of Mitotic Index and length of each phase? (1.5)

6) Identify the stages giving atleast two characteristic features.

(1x4= 4)



7) Impairment of absorption of one of the following Vitamins may result in Nutritional Anemia (0.5)
 A) B6 B) A C) B2 D) B12

8) For Immune response _____ and _____ cells are responsible. (0.5)

9) Match the following most appropriately: (*mark your answer within brackets*) (0.25X5=1.25)

- | | |
|-----------------|------------------------------------|
| 1. Anemia | A) Blood Typing () |
| 2. Erythrocytes | B) Lymphocytes () |
| 3. Immunity | C) Neutrophils () |
| 4. Phagocytosis | D) Hemoglobin () |
| 5. Haemopoiesis | E) Destroyed in spleen & liver () |

10) How many divisions are there in Micrometer Eye Piece and stage Micro meter? (0.5)

11) Define: Magnification & Resolution. (0.5x2=1.00)

12) If you take a reading of Micrometer Eye piece is 23 mm coincides with Calibration slide is 35 mm. Find the calibration constant. (1)

13) What is the normal range of RBC & WBC? (1)

14) A technician in a clinical lab diluted a blood sample to 200 times and counted 405 cells in five square grids of a Neubauer chamber. What are the cells he was counting and give the total count along with the formula? (2)

15) Complete the following table (0.5X4=2)

Blood group	Antigen	Antibody	Can donate & Receive
A			
O			
AB			
A			

16) What is the function of condenser in the Microscope? (0.5)

17) What are components of Hayem's fluid? (1)