Questions 1 to 19: All the Kodachromes are ones you have seen before. Answer the questions as simply and briefly as you can; some require only one word.

1) Slides no. 1 and 2 depict PMNs in two different fields of the same Fast smear. Those in slide no. 1 are displayed better than those in slide no. 2. What factor is most likely responsible?
   a. The degree of flattening

2) Slide no. 3 depicts stained objects found in a sputum specimen prepared by Saccomanno's method. What are they and how did they get that way?
   a. Rolled up squamous cells
   b. Two-slide pull technique

3) Slide no. 4 depicts two bloody spreads of a pleural fluid that had been immersed in 95 percent ethyl alcohol. What is the name given by Naylor to this peculiar distribution and what causes it?
   a. Ribbing effect
   b. Slow immersion in alcohol

4) Slides no. 5 and 6 are overhead views of the before and after appearance of a bloody Millipore filter preparation still in a filter holder. What step produced the change, and what caused the change, and what is the name of the event responsible for the change?
   a. Fixation in situ
   b. Diluted alcohol
   c. Hemolysis

5) Slide no. 7 depicts poorly preserved cells on a Millipore filter. What event occurred during filtration to produce such results?
   a. Air-drying

6) Slide no. 8 is a low power view of separated portions of a thick cell spread that resemble matching pieces of a jigsaw puzzle. What caused the cell spread to separate?
   a. Shrinking by alcohol

7) Slide no. 9 depicts a tissue fragment in a pleural fluid. What two factors are responsible for the poor morphology of its nuclei?
   a. Air-drying
   b. Reduced penetration by dyes
8) Slide no. 10 depicts cells well stained by the Papanicolaou method. What are its three goals?
   a. Well-stained chromatin
   b. Differential counterstaining
   c. Transparency

9) Slide no. 11 depicts a dish of Harris's hematoxylin with a surface precipitate. What is the precipitate, why does it form, why should it be removed prior to staining, and how can it be prevented?
   a. Aluminum-hematein
   b. Exceeds its solubility limit in water
   c. Avoid precipitation on slides
   d. Mix 3 parts Harris's hematoxylin with 1 part ethylene glycol

10) Slide no. 12 depicts squamous cells stained only in EA. Slide no. 13 depicts squamous cells also stained only in EA, but in this EA one important ingredient has been omitted. What is it?
    a. DTA

11) Slide no. 14 depicts a mass of non-uniformly stained cells; their cytoplasm should be stained green - just like the cytoplasm of the adjacent similar cells that are single. What is the terminology that describes this non-uniform staining, what is responsible for it and how can it be corrected?
    a. Poor leveling
    b. Non-uniform rates of penetration by dyes
    c. Increase staining time, make thinner cell spreads - ideally a monolayer

12) Slide no. 15 depicts binucleated malignant cells surrounded by refractile particles. What are these particles, how can they be removed from this preparation and how can they be prevented in future preparations?
    a. Water droplets
    b. Heat in 105 °C oven x 1 hr
    c. Filter xylene regularly to dry it
13) Slide no. 16 depicts basically well-preserved, but poorly stained cells. Evaluate the hematoxylin, OG-6 and EA: (a) what colors should the chromatin, nucleoli, and cytoplasm of these cells be stained, (b) what do the colors you see in these cells tell you about the (i) hematoxylin, (ii) OG-6 and (iii) EA, and (c) what changes would you recommend to correct the Papanicolaou stain?

   a. __blue, red, green__

   b. (i) __overoxidized__
      (ii) __not applicable__
      (iii) __exhausted__

   c. __replacement__

14) Slide no. 17 depicts two glass particles, each mounted in a medium of a different refractive index. Note that each particle is surrounded by a halo one inside a particle; the other, outside. What is the name given to this halo and what is its significance to you?

   a. __Becke line__

   b. __Knowing RI of one, can determine whether the other has a higher or lower RI__

15) Slide no. 18 depicts a small block of calcite or Iceland spar. Note that it causes double image formation. What is the name of the property that is responsible for this phenomenon? Which of the membrane filters used in cytology possesses this property? What is the practical significance of your knowing that this filter possesses this property?

   a. __Birefringence, anisotropy__

   b. __Nucleopore__

   c. __Not to expect to make pores invisible by mounting in a medium of matching RI__

16) Slide no. 19 is a microscopic view of a Millipore filter. What is responsible for its unusual appearance, what name is given to it, and what is its practical significance and how can it be prevented?

   a. __Excessive evaporation of mounting medium__

   b. __Ferm__

   c. __Cannot visualize cells__

   d. __Replace xylene in pores with mounting medium before mounting__
17) Slide no. 20 depicts cells covered with a brownish refractile material. What is this material? How does it get there? What is the name(s) given to such cells? What kind(s) of cells is(are) most likely to be affected by this artifact? How can it be prevented?

   a. [Blank]
   b. [Blank]
   c. Brown artifact, corn flakes cells
   d. Those with rough surfaces, e.g., superfiicial squamous cells
   e. Keep cells wet with xylene

18) Slide no. 21 depicts a sheet of cells which has an image that is low in contrast. What two major errors/faults/limitations - one in the illumination system and one in the image-formation system - most commonly produce such images?

   a. Wide open aperture diaphragm
   b. Excessively thick mounting medium - cover glass, dirt on high any objective

19) Slides no. 22 and 23 depict the colored edges of a field diaphragm and an in-focus tissue fragment. One of the haloes is blue; the other, orange. What does the orange halo tell you about the height of the substage condenser? What does the blue halo tell you? What should the edges of the field diaphragm look like in Kohler illumination? What does adjusting the height of the substage condenser by Kohler's method accomplish in practical terms? What are the goals of Kohler illumination?

   a. Too bright, low, high
   b. Too low, high, low
   c. Sharp edges, magenta
   d. Sets condenser at correct distance from objective so that back focal plane
   e. Uniform illumination of maximal resolution of objective can be filled with light - a prerequisite for maximal illumination
Questions 20 to 90: Read each question carefully. Some have only one correct answer; others have more. Circle the letter of each correct answer.

20) In Papanicolaou's EA stains, Bismarck brown:
   a. stains mucus.
   b. stains melanin.
   c. is precipitated by phosphotungstic acid.
   d. is responsible for the "brown artifact" in cells.
   e. is a background stain.

21) Ether-alcohol, the fixative used by Papanicolaou, is used less widely today because of:
   a. the prohibitive cost of ether.
   b. ether's flammability.
   c. the loss of ether due to its rapid rate of evaporation.
   d. inconvenience in transporting specimens.
   e. stringent storage requirements imposed by OSHA.

22) Graded percentage alcohols in hydration and dehydration series of the Papanicolaou stain:
   a. minimize convection currents and reduce cell loss.
   b. reduce the amount of distortion that can occur.
   c. eliminate the absorption of air between changes of solutions.
   d. ensure that no water is carried over into xylene.
   e. can be replaced satisfactorily by one-step hydration and one-step dehydration.

23) Ethyl alcohol may be a preservative or a fixative, the distinction being determined by:
   a. exposure time.
   b. temperature.
   c. volume
   d. percent concentration.
   e. semantics

24) Cellulosic membrane filters are most transparent when mounted in a medium of matching:
   a. diffraction.
   b. refractive index.
   c. dispersive power.
   d. polarization.
   e. chemical compatibility.

25) Compared with cells collected without preservative, cells collected in preservative which are subsequently spread on slides:
   a. adhere more strongly.
   b. flatten more.
   c. photomicrograph with greater clarity.
   d. are smaller in diameter.
   e. stain less darkly.
26) "Alcohol" used alone is generally understood to mean:
   a. methyl alcohol.
   b. isopropyl alcohol.
   c. denatured alcohol.
   d. ethyl alcohol.
   e. any kind of alcohol.

27) Cytopreparation is concerned with:
   a. collecting specimens from patients.
   b. fixatives and fixation methods that determine cytomorphology.
   c. staining cells to make them visible in light microscopy.
   d. all the methods necessary to make a microscopic preparation.
   e. making cell spreads and membrane filter preparation.

28) The goal of cytopreparation is to:
   a. exhibit selected cells in a predetermined way.
   b. demonstrate cytomorphology according to Papanicolaou's recommendations.
   c. display a representative sample of specimen in a diagnostically useful way.
   d. prepare cells for microscopic examination most economically.
   e. preserve the lifelike appearance of cells.

29) In diagnostic cytology, cells can best display their morphology when they have been collected in:
   a. an equal volume of 50% ethyl alcohol.
   b. buffered 10% formalin.
   c. a fresh and unfixed state.
   d. an equal volume of 70% alcohol.
   e. Saccomanno's preservative.

30) The four digit number following Carbowax indicates its:
   a. average molecular weight.
   b. viscosity at 25°C.
   c. dielectric constant.
   d. melting point.
   e. solubility limit in grams.

31) The particular Carbowax in Saccomanno's solution was selected over the others available because:
   a. it is more soluble in water.
   b. after the alcohol evaporates, it does not remain liquid.
   c. less toxic.
   d. more inflammable.

32) Although introduced for use with sputum, Saccomanno's solution may be used satisfactorily in certain situations with:
   a. urine.
   b. CSF's.
   c. body cavity fluids.
   d. all cytologic specimens.
   e. gynecologic specimens.
33) In their effects on cells, the major difference between a preservative and a fixative is the degree of:

a. distortion.

b. hardening.

c. preservation of lifelike appearance.

d. shrinkage.

e. resistance to microbial decay.

34) Generally fixatives may be said to produce which of the following effects:

a. promote autolysis.

b. harden protoplasm.

c. prevent shrinkage-distortion.

d. bacteriostasis.

e. kill cells.

f. make cells stainable.

35) Saccomanno's method of processing sputum calls for collecting it in:

a. 2% Carbowax 1450 in 50% alcohol.

b. 1% polyethylene glycol in 50% alcohol.

c. 2% Carbowax 400 in 50% alcohol.

d. 3% Carbowax 1450 in 70% alcohol.

e. 1% water soluble wax in 30% alcohol.

36) As described by Saccomanno in 1963, the purpose of Carbowax in alcohol is to:

a. protect cells during homogenization.

b. improve staining.

c. minimize cellular shrinkage during air-drying.

d. enhance fixation.

e. increase cell recovery.

37) All of the following influence the display of cytomorphology on slides except:

a. the type of fixative.

b. the concentration of fixative.

c. the water content of cells.

d. the inclusion of Carbowax.

e. whether air-drying occurs.

f. whether the cells are in suspension or on a surface when fixed.

38) All the following may be used for fixation in diagnostic cytology except:

a. absolute methyl alcohol.

b. 95% ethyl alcohol.

c. 10% formalin.

d. 90% acetone.

e. reagent grade alcohol.
39) Following regressive staining in Harris's hematoxylin, the immersion of slides in dilute hydrochloric acid:

   a. changes the color of hematoxylin from red to blue.
   b. removes most of the stain from the cytoplasm and some from the nucleus.
   c. makes nucleoli red.
   d. extracts all the hematoxylin from the cytoplasm.

40) Water in xylene:

   a. accumulates from the air and carryover of preceding solutions.
   b. may be prevented by keeping the preceding solutions at a higher level.
   c. may be removed by filtering the xylene through a bibulous filter.
   d. is evident microscopically as spheres with thick dark brown outlines.

41) Which of the following is (are) not recommended for blueing:

   a. Scott's tap water substitute for 1 min.
   b. Running tap water for 10 min.
   c. 1.5% NH₄OH in 70% EtOH.
   d. 0.1% potassium acetate.
   e. 0.1% sodium bicarbonate.

42) Prior to filtration, pre-expansion is required for:

   a. cellulosic filters.
   c. Millipore filters.
   d. polycarbonate filters.
   e. Gelman filters.

43) The negative pressure recommended for filtration with Nuclepore filters is:

   a. 100 mm Hg.
   b. 20 mm Hg.
   c. 50 mm Hg.
   d. 0 mm Hg.
   e. 200 mm Hg.

44) After cell collection on membrane filters, fixation in situ:

   a. decreases cell recovery on polycarbonate filters.
   b. minimizes cellular damage by accidental air-drying.
   c. hemolyzes RBC's on cellulosic filters.
   d. hemolyzes RBC's on polycarbonate filters.
   e. aids the passage of debris through cellulosic filters.

45) Which of the following is (are) useful for microbiological safety:

   a. ultra violet light.
   b. containment of waste.
   c. autoclaving.
   d. phenol-based disinfectants.
   e. disposable supplies.
46) Compared to thin slides, thick slides:
   a. take up more filing space.
   b. fit as easily into the slots of metal staining racks.
   c. prevent strict Kohler illumination.
   d. break more readily.
   e. require thinner cover glasses.

47) Normal saline, Polysal and Hanks' BSS:
   a. can be used interchangeably in cytopreparation.
   b. are priced about the same.
   c. have increasingly elaborate compositions.
   d. are all iso-osmotic.
   e. each has a physiologic pH.

48) How many units of heparin per cc capacity are recommended for collection containers used for body cavity fluids?
   a. 1.
   b. 2.
   c. 3.
   d. 4.
   e. 5.

49) When coverslapping, the most important error to avoid is:
   a. applying too much mounting medium.
   b. allowing the cell spread to air-dry.
   c. touching the preparation with the dropper rod.
   d. applying too little mounting medium.
   e. entrapping air bubbles.

50) When not in use, staining dishes should be kept covered primarily to:
   a. prevent accumulation of airborne dust.
   b. reduce evaporation of the reagents.
   c. diminish absorption of atmospheric water.
   d. maintain the strength of the reagents.

51) Although economically attractive, liquid substitutes for cover glasses are unsuitable because of their:
   a. uncontrollable thickness.
   b. refractive index.
   c. uneven surface.
   d. dispersion.
   e. leaving thick cellular groups partially covered.

52) The outlines of the pores in Nuclepore filters can not be completely "removed" optically by mounting the filter in a suitable mounting medium because Nuclepore filters are:
   a. made of polycarbonate.
   b. isotropic.
   c. birefringent.
   d. polarized.
53) Following regressive staining in Harris's hematoxylin, the immersion of slides in dilute hydrochloric acid is called:

a. distinguishing.
b. discrimination.
c. differentiation.
d. destaining.
e. decolorization.

54) Which of the following does not denote a specific formula alcohol:

a. reagent grade alcohol.
b. denatured alcohol.
c. absolute ethanol.
d. isopropyl alcohol.
e. alcohol.

55) Flammable and combustible:

a. are synonymous.
b. are hazard ratings for volatile liquids and paper, respectively.
c. differentiate between different levels of fire hazards.

56) After being coverslipped, a batch of slides is cloudy. Which of the following step(s) would you take to correct this problem?

a. replace the xylene in the staining schedule.
b. use absolute alcohol throughout staining.
c. dry the coverslipped slides in a 100°C oven overnight.
d. replace the xylene and the preceding absolute alcohols.
e. pass the xylene through laboratory grade filter paper.

57) The number designation on boxes of cover glasses (e.g., No. 0, No. 1) indicates their:

a. refractive index.
b. thickness.
c. homogeneity
d. dispersion.
e. surface quality.

58) The number designation of cover glasses recommended by manufacturers of microscopes is:

a. No. 0
b. No. 1
c. No. 1½
d. No. 2
e. No. 3

59) The number designation of cover glasses that is recommended by experience is:

a. No. 0
b. No. 1
c. No. 1½
d. No. 2
e. No. 3
60) Normal saline is equivalent to:
   a. 0.154 M NaCl.
   b. 0.9% (w/v) NaCl.
   c. a balanced electrolyte solution.
   d. minimal essential media.

61) Different fixatives:
   a. produce similar results morphologically.
   b. act by different chemical mechanisms.
   c. can be used interchangeably with identical results.
   d. are more useful for some purposes than others.

62) 95 percent ethyl alcohol:
   a. causes significant shrinkage in cells.
   b. can be purchased tax-free by private laboratories.
   c. maintains intact all subcellular particles (e.g., ribosomes, mitochondria, lysosomes).
   d. cause measurable loss of protein from cells.

63) Following immediate wet fixation in 95 percent ethyl alcohol, cells:
   a. can be allowed to air-dry without subsequent morphologic changes.
   b. undergo swelling after passage through the reagents in the Papanicolaou staining procedure.
   c. are rendered more readily stainable.
   d. can remain in it indefinitely.

64) The standard Papanicolaou stain uses:
   a. progressive hematoxylin staining.
   b. regressive hematoxylin staining.
   c. any one of three different EA-65 formulas.
   d. graded alcohols.
   e. all of the above.

65) Series of graded percent concentrations of alcohol in the hydration and dehydration of cell spreads:
   a. prevent the loss of cells by diffusion currents.
   b. minimize shrinkage.
   c. displace alcohol or water more effectively.
   d. serve no demonstrably useful purpose.
   e. prevent absorption of air during dipping.

66) Resinous mounting media:
   a. are passive reagents that merely surround cells and act as an adhesive for the cover glass.
   b. are dynamic reagents with many properties that manifest themselves at different points in time.
   c. relative to their refractive index, must be chosen more knowledgeably in cytology than in histology.
   d. are miscible with water.
67) Glass cover slips:
   a. simply protect the specimen.
   b. are considered to be the first lens of the microscopical objective.
   c. affect microscopical visualization to an extent dependent on numerical aperture of the objective.
   d. may be conveniently replaced without detriment to image quality by liquid substitutes.

68) In Kohler illumination:
   a. three focal planes are simultaneously in focus.
   b. the field diaphragm controls the numerical aperture of the objective.
   c. the substage condenser diaphragm controls the size of the field.
   d. a synonym is "controlled illumination".

69) Orange G:
   a. stains keratin and erythrocytes.
   b. need contain only 80 percent dye to be certified by the Biological Stain Commission.
   c. is a basic dye.
   d. is within its solubility limit in Papanicolaou's OG-6 formula.

70) The following are true of Bismarck brown Y in Papanicolaou's EA formulas except:
   a. it is an acid dye.
   b. it serves no useful purpose and can be deleted.
   c. it is precipitated by phoshotungstic acid.
   d. it need contain only 45 percent dye content to be certified by the Biological Stain Commission.

71) Eosin Y and light green SF yellowish:
   a. contain impurities that may or may not be colored.
   b. perform best in a pH range of 5 to 8.
   c. need contain a minimum of 80 and 65 percent dye, respectively, to be certified by the Biological Stain Commission.
   d. can be differentiated by alcohol.
   e. all of the above are true.

72) Xylene:
   a. makes cells transparent.
   b. is miscible with water.
   c. may be dried by filtering it through bibulous filter paper.
   d. extracts counterstains from cells.
   e. causes additional cellular shrinkage.

73) Full strength formalin is a 40 percent aqueous solution of formaldehyde gas. To prepared a 10 percent formalin solution, you would add:
   a. 30 ml of formalin to 10 ml water.
   b. 10 ml of water to 30 ml formalin.
   c. 1 ml of formalin to 39 ml water.
   d. 10 ml of formalin to 100 ml water.
   e. 10 ml of formalin to 90 ml water.
74) If excessive negative pressure is applied during cell collection on membrane filters, all the following are true except:

- the risk of drying cells is increased.
- RBCs and PMNs will be pulled through the pores of a Nuclepore.
- cell morphology will be damaged.
- is mistakenly accused of producing cytologic artifacts that are really caused by air-drying the filter.

75) To accurately identify a biological stain, its C.I. No. should be cited. C.I. means:

- Commission Identified.
- Colour Index.
- Correct Identity.
- Commission Index.
- Certification Identification.

76) Good cellular display results from good cellular:

- cohesion.
- flattening.
- preservation.
- fixation.
- coagulation.

77) Non-GYN specimens collected fresh and unfixed, but that cannot be prepared until the following day should be:

- discarded.
- repeated.
- refrigerated.
- refused.
- put in preservative.

78) When the cytopreparation of a non-GYN specimen will be delayed for several days, the specimen should be mixed with:

- 95% ethyl alcohol.
- 10% formalin.
- 70% ethyl alcohol.
- equal parts of 50% ethyl alcohol.
- equal parts of 70% ethyl alcohol.

79) Which of the following is (are) well suited for collection on membrane filters:

- Sputum in Saccomanno's preservative.
- Urine in an equal volume of 50% alcohol.
- Pleural fluids without heparin added.
- Uniform cell suspensions.
- Cerebrospinal fluids.
80) During the spreading of cells on a micro slide by the two slide pull method; which of the following is affected primarily:

a. cell distribution.
b. cell flattening.
c. cell recovery.
d. cell preservation.
e. cell mix.

81) What is the limit of negative pressure in mm Hg that should be used during filtration with Nuclepore filters?

a. 0
b. 10
c. 20
d. 40
e. 100

82) Which of the following Carbowaxes is the one recommended by Saccomanno for use in 50 percent alcohol:

a. 600
b. 1500
c. 1000
d. 1540
e. 4000

83) The recommended minimum length of time for fixation in 95 percent ethyl alcohol is:

a. 1 minute
b. 15 minutes
c. 30 minutes
d. 1 hour
e. 2 hours

84) Which of the following should be evaluated when assessing the performance of a stain?

a. Contrast
b. Optical density
c. Visibility
d. Color
e. Distribution

85) Match the ingredient with its purpose.

a. Hematoxylin  
   Source of hematein
b. Sodium iodate  
   Mordant
c. Mercuric oxide  
   Increases solubility limit of solution for hematein
d. Glacial acetic acid  
   Oxidizing agent  
   Increases selectivity of stain for chromatin
e. Ethylene glycol  
   f. Aluminum sulfate
86) How much sodium iodate is required to oxidize half of 1 gm of hematoxylin?
   a. 0.2 gm
   b. 0.1 gm
   c. 0.02 gm
   d. 200 mgm
   e. 0.01 gm

87) For what thickness of cover glass are American-made objectives corrected?
   a. 0.13 mm
   b. 0.15 mm
   c. 0.16 mm
   d. 0.17 mm
   e. 0.18 mm

88) Match the No. thickness of cover glass to its application.
   a. No. 0
   - Cell spreads on a micro slide
   b. No. 1
   - Tissue under oil immersion
   c. No. 1-1½
   - "Cooked" monolayer cell spreads
   d. No. 2
   - Nucleopore filters dissolved on a cover glass
   e. Cell spreads on a cover glass

89) In establishing Kohler illumination, the field diaphragm and aperture diaphragm settings are determined primarily by the:
   a. contrast in the specimen.
   b. the objective.
   c. the eyepieces.
   d. the illumination.
   e. lamp condenser.

90) In a microscope adjusted for Kohler illumination, which one of the following controls affects image quality most noticeably - especially under 40X?
   a. Field diaphragm
   b. Substage condenser diaphragm
   c. Auxiliary swing-in condenser
   d. Substage condenser height
   e. Centration of field diaphragm

91) Check the column to indicate whether the material or method promotes, retards or has no effect on cell flattening:

<table>
<thead>
<tr>
<th>Material/Method</th>
<th>Promotes</th>
<th>Retards</th>
<th>No Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Clean slides</td>
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<tr>
<td>b. Albuminized slides</td>
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<tr>
<td>c. Collection in 70% alcohol</td>
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<td>d. Poly-1-lysine coated slides</td>
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<tr>
<td>e. Membrane filtration</td>
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<td>f. Cyto centrifugation</td>
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<tr>
<td>g. Unfixed cells</td>
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<tr>
<td>h. Two slide pull technique</td>
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<tr>
<td>i. Cotton swab spread technique</td>
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<td>j. Protein in solution</td>
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<tr>
<td>k. Frosted slides</td>
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</table>
92) Match the following:

a. Millipore filters  
   b. Nuclepore filters  
   c. Hemolysis  
   d. Unfixed specimens  
   e. Clear urine specimens  
   f. Normal saline  
   g. Thickness of Gelman Filter  
   h. Cells pushed through Nuclepore filter

   Platten well  
   Distorts cells  
   No. 1 cover glass  
   100 mm Hg negative pressure  
   Fixation in situ  
   Made of cellulosic products  
   Made of polycarbonate  
   Centrifuge before filtration

93) Check the appropriate column to indicate whether the solution is a satisfactory alternative to 95 percent ethyl alcohol:

<table>
<thead>
<tr>
<th>Satisfactory</th>
<th>Unsatisfactory</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Reagent grade alcohol</td>
<td></td>
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<tr>
<td>b. Proprietary alcohol</td>
<td></td>
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<tr>
<td>c. Absolute isopropyl alcohol</td>
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<td>d. Absolute methyl alcohol</td>
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<tr>
<td>e. Absolute ethyl alcohol</td>
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<tr>
<td>f. 80% isopropyl alcohol</td>
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<tr>
<td>g. 10% formalin</td>
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<tr>
<td>h. 90% acetone</td>
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<tr>
<td>i. Clarke's fluid</td>
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</table>

94) Match the dyes with the parts of the cells that are colored by each.

| a. Hematoxylin | c. (a, d, e) Mucus |
| b. Orange G | e. Nucleoli |
| c. Bismarck brown Y | f. Keratin |
| d. Light green SF yellowish | (a, b) | e. Erythrocytes |
| e. Eosin Y | f. Cilia |
| f. None | a. Cytoplasm of superficial squamous cells |
| | b. Cytoplasm of metabolic cells |
| | f. Melanin |
| | a. Chromatin |
| | f. Carbon particles |

95) Percent concentration is often followed by w/v or v/v. What is the meaning of these abbreviations?

Answer: weight/volume, volume/volume

96) Given 95 percent ethyl alcohol, how many milliliters must be mixed with how many milliliters of water to make 1 liter of 70 percent ethyl alcohol?

Answer: 736.8 mL 95% EtOH

   263.2 mL H2O
97) Given Orange G of 85 percent dye content, how many grams are needed to prepare 100 mls of a 10 percent solution?

Answer: 11.76 gm

98) How many grams of Carbowax must be dissolved in how many milliliters of 95 percent ethyl alcohol and of water to produce a 2 percent solution in 50 percent ethyl alcohol?

Answer: 526 ml 95% EtOH, 459 ml water, 20 ml Carbowax

99) Given NaCl (MW=58.5), how many grams are necessary to produce a 0.154M solution?

Answer: 9.009 gm

100) Given a liter of concentrated HCl, 38 percent concentration, S.G. = 1.1923 and MW = 36.5, what is its normality? mL HCl @ 38% to produce 1 L of 0.5% NaCl

Answer: 12.4 N

\[
\begin{align*}
96) \quad & \frac{0.95x}{1,000} = 0.75 \\
& x = 750 + 0.95 \\
& x = 736.8 \text{ ml} \\
98) \quad & \frac{0.95x}{1,000} = 0.50 \\
& x = 500 + 0.95 \\
& x = 526 \text{ ml } 95\% \text{ EtOH} \\
& 1,000 - 526 = 474 \text{ ml water} \\
& 479 \text{ ml water} - 20 \text{ ml Carbowax} = 459 \text{ ml water} \\
97) \quad & \frac{10 \text{ gm}}{0.85} = x \\
& x = 11.76 \\
99) \quad & \frac{58.5 \text{ gm}}{0.154 \text{ mol}} = 9.009 \text{ gm}
\end{align*}
\]
97) Given Orange G of 85 percent dye content, how many grams are needed to prepare 100 ml of a 10 percent solution?

Answer: ________________________________

98) How many grams of Carbowax must be dissolved in how many milliliters of 95 percent ethyl alcohol and of water to produce one liter of a 2 percent solution in 50 percent ethyl alcohol?

Answer: ________________________________

99) Given NaCl (MW=58.5), how many grams are necessary to produce one liter of a 0.154M solution?

Answer: ________________________________

100) Given a liter of concentrated HCl, 38 percent concentration, S.G. = 1.1923 and MW = 36.5, what is its normality? How many ml of this concentration of HCl must be added to how many ml of water to produce one liter of a 0.5 percent solution?

Answers: ________________________________

101) Match the dye with the minimum percent dye content that it must possess in order to be accepted by the Biological Stain Commission (some choices may be distractors).

a. Hematoxylin  
   b. Orange G  
   c. Bismarck brown Y  
   d. Light green SF yellowish  
   e. Eosin Y  

- a.  
- b.  
- c.  
- d.  
- e.  

Not applicable  
45%  
65%  
80%  
85%
102) Erythrocytes of specimens collected in 50 percent ethanol are:
   a. fixed
   b. shrunk
   c. hemolyzed
   d. crenated
   e. destroyed

103) The optical density of a dye in cells is the difference between the amount put in by the dye solutions and the amount removed by the rinses.

104) Partially closing the aperture diaphragm below the diameter that "fills the back focal plane of the objective in use with light":
   a. changes the working N.A. of the objective
   b. decreases the depth of field
   c. increases the depth of focus
   d. decreases the objective's sensitivity to cover glass thickness
   e. decreases contrast

105) Dust at or near which focal plane(s) along a microscope's optical axis will be visible in the same focal plane as that of a specimen examined under a 10X objective?
   a. Lamp condenser
   b. Field diaphragm
   c. Substage condenser top lens
   d. Cover glass
   e. Objective front lens
   f. Field lens

106) Match the solvent with the type of dirt on a cover glass or objective front lens for which it is best suited to remove.
   a. Xylene   
   b. Lens cleaner
   c. Ether
   d. Water
   e. Detergent
   f. Grease pencil
   g. Mounting medium
   h. Immersion oil
   i. Dotting ink
   j. Fingerprint

107) N.A. engraved on some microscopical objectives' barrels is an abbreviation for numerical aperture.

108) 40X objectives with 0.95 N.A.'s, as opposed to 40X objectives with 0.6 N.A.:
   a. are insensitive to cover glass thickness.
   b. are probably plan(achromats).
   c. have short working distances.
   d. are less "forgiving" than their lower N.A. cohorts of equal magnification.
   e. can resolve finer details.
109) T F Biological safety cabinets can be used safely as fume hoods.

110) T F Fume hoods can be used safely as biological safety cabinets.

111) T F Portable fume hoods with charcoal filters are an effective and economical alternative to conventional fume hoods.

112) T F Alkali splashed to the eye should be neutralized immediately with vinegar.

113) T F Chemicals splashed to the eye should be rinsed with running water for 15 minutes.

114) Most laboratory-associated infections occur by (select one):
   a. absorption
   b. contact
   c. ingestion
   d. inhalation

115) Fume hoods in which xylene is used should have an average face velocity of:
   a. 50 fpm
   b. 75 fpm
   c. 100 fpm
   d. 125 fpm
   e. 150 fpm

116) The maximum quantity of Class IA flammable liquids in flammable safety storage cans that can be kept in a laboratory without a flammable safety cabinet is:
   a. 2 gallons
   b. 5 gallons
   c. 10 gallons
   d. 15 gallons
   e. 20 gallons

117) According to the NFPA and OSHA, the largest capacity glass or plastic container in which Class IA flammable liquids should be stored is:
   a. 1 pint
   b. 1 quart
   c. ½ gallon
   d. 1 gallon
   e. 2 gallons

118) T F When being mixed, water should always be added to acid to avoid the possibility of exothermally induced chemical splashes.
119) HEPA is an abbreviation for:
   a. human epithelial analog
   b. high energy protective apparatus
c. high efficiency particulate air
d. high efficiency particulate arrestance

120) To double the RCF obtained at a given speed in a laboratory centrifuge:
   a. halve the centrifugation speed
   b. double the centrifugation speed
c. change rotors
d. increase the centrifugation speed by a factor of 1.414
e. increase the centrifugation speed by a factor of 1.732