

Class 12 Medical Diagnostics 2025 Solved Paper

Time allowed : 3 hours

Maximum Marks: 60

SECTION-A

(Objective Type Questions)

1. Answer any 4 out of the given 6 questions on Employability Skills. $4 \times 1 = 4$

(i) Every effective conversation starts with _____.

- (A) Writing
- (C) Shouting
- (B) Listening**
- (D) Learning

(ii) _____ is feeling extremely nervous and worried because you believe that other people do not like you or are trying to harm you.

- (A) Paranoid**
- (B) Antisocial
- (C) Narcissistic
- (D) Dependent

(iii) A _____ makes a person happier, and helps to build and maintain relationships.

- (A) Positive attitude**
- (B) Negative attitude
- (C) Demotivation
- (D) Fighting

(iv) A _____ is an electronic document used to store data in a systematic way and perform calculations just like an expense sheet.

- (A) Spreadsheet**
- (B) Worksheet
- (C) Workbook
- (D) Name box

(v) Which one of the following is not a characteristic of entrepreneurship?

- (A) It is an economic activity done to create, develop and maintain a profit oriented organization.
- (B) It deals with optimization in utilization of resources.
- (C) It avoids any kind of risk in business.**
- (D) It is the ability of an enterprise and an entrepreneur to take risks.

(vi) Which of the following skills is NOT considered a green skill?

- (A) Renewable energy technology
- (B) Sustainable agriculture
- (C) Financial management**
- (D) Waste management and recycling

2. Answer any 5 out of the given 7 questions. $5 \times 1 = 5$

(i) ____ is used for clamping the segment of the blood bag after it is collected.

- (A) Blood collection monitor
- (B) Tube sealer**
- (C) Blood donor couch
- (D) Blood collection bag

(ii) The normal value of PT is :

- (A) 10-12 seconds**
- (B) 18-25 seconds
- (D) 41 - 52 seconds
- (C) 26-40 seconds

(iii) The ____ uses white light, either the external sunlight or the internal tungsten filament lamp, as the source of illumination.

- (A) Light microscope**
- (C) Polarizing microscope
- (B) Electron microscope
- (D) Inverted microscope

(iv) Two antigens Jka and Jkb in this blood group system are present. The antibodies may be either IgG or IgM and may cause HTR or HDN. Identify the blood group system.

- (A) Kell system
- (C) Kidd blood group system**
- (B) Duffy system
- (D) P system

(v) The ideal fixative recommended in most of the laboratories for cytological specimens. It produces optimal nuclear details but some amount of cell shrinkage. Absolute (100%) ethanol produces a similar effect on cells. But, it is much more expensive. Identify the routine fixative.

- (A) Denatured alcohol
- (B) 100% Methanol
- (C) Ether alcohol mixture**

(D) 95% Ethyl Alcohol (Ethanol)

(vi) The lump is immobilized with the left hand in a position favourable for needle aspiration and holding the syringe by the barrel in the right hand; the needle is pushed into predetermined site of the lump until needle tip penetrates the centre of the lump. Identify the procedure.

(A) FNAC

(C) X-ray

(B) MRI

(D) CT Scan

(vii) Suppose you are performing the ABO Blood grouping test for unknown sample in laboratory. You have put three reagents of Anti A, Anti B and Anti D on your slides and you have added blood on that reagents and mixed it properly. After waiting for sometime, you will get the result that is shown in the table. Observe the following table and identify the blood group.

Anti A	Anti B	Anti D
(+) Positive	(+) Positive	(-) Negative
(A) AB+		
(B) AB-		
(C) A+		
(D) B+		

3. Answer any 6 out of the given 7 questions. $6 \times 1 = 6$

(i) This is the ideal fixative used for cellblock preparation of fluid specimens. Name the special-purpose fixative.

(A) Saccomanno collection fluid

(B) Cytolyt solution

(C) AAF fixative

(D) Carnoy's fixative

(ii) Scrape the _____ lesion with a tongue depressor, spread material on a clean slide and fix immediately during the cytological sample collection.

(A) Mouth (Oral)

(C) Skin

(B) Nasal

(D) Scalp

(iii) Pericardial fluid is obtained from

(A) Heart

- (C) Abdominal cavity
- (B) Lungs
- (D) Bone joints

(iv) 0.15 g of powdered Leishman's stain is obtained by dissolving in 100 ml of

- (A) acetone-free methyl alcohol**
- (B) acetone-free ethyl alcohol
- (C) acetate-free methyl alcohol
- (D) acetate-free ethyl alcohol

(v) What type of blood cells contain Rh antigens?

- (A) Red blood**
- (C) Platelet
- (B) White blood
- (D) Reticulocytes

(vi) Name the deoxyribose sugar, each base can bind with the addition of the phosphate group makes the compound a nucleotide.

- (A) Nucleoside**
- (C) Nucleon
- (B) Nucleus
- (D) Nucleolus

(vii) When soluble antibody reacts with soluble antigen, there is the formation of visible insoluble complex.

- (A) Agglutination
- (B) Hemolysis
- (C) Precipitation**
- (D) ELISA

4. Answer any 5 out of the given 6 questions: $5 \times 1 = 5$

(i) The blood group system contains two antigens Fya and Fyb. Plasmodium vivax infection does not affect red cells lacking Fya and Fyb, anti-Fya and Fyb antibodies are IgG and react at 37 °C and cause hemolytic reaction and hemolytic disease of the newborn (HTR and HDN). Identify the blood group system.

- (A) Kell system
- (B) Duffy system**
- (C) Kidd blood group system
- (D) P system

(ii) It is ethanol that has been changed by the addition of additives in order to render it unsuitable for human consumption. This can be used at a concentration of 95% or 100%. One formula is 90 parts of 95% ethanol + 5 parts of 100% methanol + 5 parts of 100% isopropanol. Identify the routine fixative.

- (A) Denatured alcohol
- (B) 100% methanol
- (C) Ether alcohol mixture**
- (D) 95% Ethyl alcohol (Ethanol)

(iii) The high-power objective gives total magnification.

- (A) $10 \times 10 = 100x$
- (B) $10 \times 40 = 400x$**
- (C) $10 \times 65 = 650x$
- (D) $10 \times 100 = 1000x$

(iv) ____, more specifically, immunoglobulins are recognized by interaction with antigens. Name the serum proteins.

- (A) Pathogen
- (B) Intron
- (C) Exon
- (D) Antibodies**

(v) Synovial fluid is obtained from

- (A) Heart
- (C) Abdominal cavity
- (B) Lungs
- (D) Bone joints**

(vi) When you add blood with Anti A, Anti B, and Anti D reagents, you get the following results shown in the table. Identify the blood group.

Anti A	Anti B	Anti D
(-) Negative	(-) Negative	(+) Positive
(A) AB+		
(B) AB-		
(C) A+		
(D) O+		

5. Answer any 5 out of the given 6 questions. $5 \times 1 = 5$

(i) It is advisable that ____ are stored with utmost care in appropriate storage cabinets that are designed for this purpose.

(A) Flammable materials

(B) Cleaning agents

(C) Cotton materials

(D) Sanitary products

(ii) Which vial is used to collect blood for Differential count?

(A) Plain

(B) EDTA

(C) Trisodium citrate

(D) Double oxalate

(iii) How much amount of anticoagulant is used in 450 ml of blood bag?

(A) 53 ml

(B) 63 ml

(C) 73 ml

(D) 83 ml

(iv) This is a clear water based buffered fixative for the collection of fluid specimens. A 50:50 ratio of specimen to fixative is appropriate (if this unavailable use 50% alcohol). Name the special-purpose fixative.

(A) Saccomanno collection fluid

(B) Cytolyt solution

(C) AAF fixative

(D) Carnoy's fixative

(v) Write down the full form of APTT.

(A) Activated Prothrombin Thromboplastin Time

(B) Activated Prothrombin Thrombin Time

(C) Activated Partial Thromboplastin Time

(D) Activated Partial Thrombin Time

(vi) All laboratories must retain cytology slides for a minimum of

(A) five years

(B) ten years

(C) fifteen years

(D) twenty years

6. Answer any 5 out of the given 6 questions. $5 \times 1 = 5$

(i) _____ is a juvenile RBC.

(A) Lymphocyte

- (B) Reticulocyte**
- (C) Monocyte
- (D) Thrombocyte

(ii) In this procedure, aspiration is done using disposable needles of 21 gauge (external diameter approximately 0.6 - 1.0 mm) attached to a 20 ml syringe. Identify the procedure.

- (A) FNAC**
- (B) MRI
- (C) X-ray
- (D) CT Scan

(iii) It is advisable that ____ are stored with utmost care in appropriate storage cabinets that are designed for this purpose.

- (A) Reagents used for daily basis
- (B) Samples
- (C) Flammable materials**
- (D) Waste materials

(iv) Measures about 12 μm in diameter, nucleus stains deep purple in colour, lobes connected by delicate filament. The number of lobes varies from two to five. Cytoplasm is colourless and contains tiny, tan to pink granules. Constitute 40 - 80% of WBC in adults. Identify the blood cell.

- (A) Eosinophil
- (B) Basophil
- (C) Monocyte
- (D) Neutrophil**

(v) In _____ anemias, the MCV is normal.

- (A) Microcytic
- (B) Macrocytic
- (C) Normocytic**
- (D) Hyperchromic

(vi) Pleural fluid is obtained from ____.

- (A) Heart
- (C) Abdominal cavity
- (B) Lungs**
- (D) Bone joints

SECTION-B

(Subjective Type Questions)

Answer any 3 out of the given 5 questions on Employability Skills in 20-30 words each. 3x2=6

7. What are the different types of communication?

Ans: i. verbal form ii. non-verbal form iii. written form iv. visual form

8. Self-motivation is significant in building one's personality. Comment.

Ans: Self-motivation is important because

- It increases an individual's energy and activity
- It directs an individual towards specific goals.
- It results in the initiation and persistence of specific activities
- It affects cognitive processes and learning strategies used for completing similar tasks.

9. What is cell referencing in a spreadsheet?

Ans: A cell reference identifies a cell or a range of cells. Each cell in the worksheet has a unique address formed by the combination of its intersecting row and column. When a cell address is referred to in a formula, it is called cell referencing.

10. Rahul has a successful startup company. According to him "Decision Making is considered to one of the important entrepreneurial competency". Do you agree with Rahul's opinion? Justify.

Ans: Yes, decision-making is one of the important entrepreneurial competencies. Entrepreneurs often have to make that one decision at the right time, which can define the future of their company. And then they also have to quickly act upon their decisions.

11. What is the role of water quality technician?

Ans: Water Pollution is in its alarming state. This has given rise to the need of Water Quality Technicians to help monitor the water quality and treat it.

Answer any 3 out of the given 5 questions in 20-30 words each. 3 x 2 = 6

12. During Agglutination reaction, why is it important to wash the cells?

Ans: 1. Washing improves reactivity and removes plasma that contains fibrinogen and forms a clot when mixed with serum, giving a false positive.
2. Plasma can cause rouleaux's formation.
3. Anticoagulant present in plasma is anticomplementary and inhibits complement binding reactions.
4. Plasma contains blood group substances that can neutralize that reaction.

13. Explain two problems, that can be caused due to excess use of EDTA while collection of blood sample.

Ans: EDTA above 2 mg/ml may produce changes in RBCs irrespective of the salt used. An increased MCHC and a decreased PCV (by manual method) may be seen. Excessive EDTA may also lead to a spuriously high platelet count (platelets may swell and then disintegrate into fragments, which are counted as platelets).

14. You are using cytological fixatives in your laboratory. How can you say that fixatives that you use are good in nature or not?

Ans: Properties of a good cytological fixative :

- It should not excessively shrink or swell cells.
- It should not distort or dissolve cellular components.
- It should help preserve nuclear details.
- It should improve optical differentiation and enhance the staining properties of the tissues and cell components.

15. Enumerate two methods of venipuncture.

Ans: The two methods of Venipuncture are

- Syringe method.
- Evacuated tube collection system.

16. Write a short note about Immune antibodies.

Ans: Immune antibodies are IgG. They develop due to immunization following pregnancy, previous transfusion, or deliberate injection of immunogenic material. In some instances, the immunogenic event is unknown.

Answer any 2 out of the given 3 questions in 30-50 words each. $2 \times 3 = 6$

17. How can you process bone marrow aspirate?

Ans: Bone marrow aspirate can be processed in three ways.

- Smear preparation for studying morphology, cytochemistry, and FISH if required.
- Anti-coagulated sample is subject to EDTA-flow cytometry, cytogenetic studies, and molecular studies.
- Clot preparation is processed as a biopsy.

18. Briefly describe about the following special-purpose fixatives: 50% alcohol, Carnoy's fixative.

Ans: (a) 50% Alcohol: This is a clear fixative for the collection of fluid specimens. A 50:50 ratio of specimen to fixative is considered appropriate.

(b) Carnoy's fixative: This is a special-purpose fixative for haemorrhagic samples. The acetic acid in the fixative haemolyses the red blood cells. It is an excellent nuclear fixative as well as

preservative for glycogen but results in considerable shrinkage of cells. Carnoy's fixative must be prepared fresh when needed and discarded after each use. It loses its effectiveness on long standing, and chloroform can react with acetic acid to form hydrochloric acid.

19. Briefly discuss about following blood group system: Duffy system, Kidd blood group system.

Ans: Duffy system

- Duffy system contains two antigens Fya and Fyb
- Plasmodium vivax infection does not affect red cells lacking Fya and Fyb
- Anti Fya and Fyb antibodies are IgG and react at 37 deg c and cause hemolytic reaction and hemolytic disease of the newborn (HTR and HDN)
- Duffy antigens are classified as Fy (a+b-), Fy (a+b+), Fy (a-b+), Fy (a-b-)
- Kidd blood group system
- Two antigens Jka and Jkb
- The antibodies may be either IgG or IgM and may cause HTR or HDN

Answer any 3 out of the given 5 questions in 50-80 words each. $3 \times 4 = 12$

20. Write down the role of microscope in Hematology laboratory.

Ans: This instrument helps us to examine tiny objects that cannot be visualized with the naked eye. It is a delicate instrument and needs utmost care.

- (a) Cleaning of the objective and eyepiece should be done regularly, and they should be kept free from dust. The optical part is cleaned to remove grease using a soft cloth or lens paper.
- (b) Hold the microscope firmly while moving it to prevent the lenses from dropping down.
- (c) Exposure to sunlight should be avoided and it should be kept at room temperature.
- (d) After one can use oil immersion, one must always clean the oil from the objective.

21. Enumerate the equipment used for blood component preparation.

Ans: (a) electronic weighing machine: for weighing the bags accurately.

(b) refrigerated centrifuge: bucket handle type of centrifuge to hold the collected bags with a provision for a wide range of temperatures is preferred. The main unit is built on a sturdy metal frame resting on castors and enclosed by sheet metal, which has an electrical interlock. Rotor consists of 4 to 6 buckets.

(c) Plasma expessor: to manually express the plasma

(d) Cell separator is an instrument used to separate whatever components required for the patients.

22. How can you deal with Hemorrhagic fluids in laboratory?

Ans: Procedure for hemorrhagic fluids

- Frankly hemorrhagic fluids are centrifuged like all fluids, and fish-tailed smears are made from the sediment of the centrifuged deposit.
- Alternatively, if very hemorrhagic, smears can be air dried and then flooded with normal saline for 30 seconds. This causes layers of red cells; smears are then air dried or wet fixed and stained by pap and Giemsa stains, respectively.

23. How can you measure the efficiency of all stages of intrinsic pathway of coagulation by performing screening test?

Ans: The efficiency of all stages of the intrinsic pathway of coagulation can be screened by the clotting time test by Lee White method.

Sample: Fresh whole blood 4 ml.

Procedure:

- About 2 ml of blood is collected and dispensed in two test tubes (1 ml each). The stopwatch is started immediately.
- The test tubes are kept at 37°C after putting cotton plugs.
- After about 3 minutes, take out one tube, tilt it gently by 45°C and observe whether blood has clotted (the test tube can be inverted without the blood spilling).
- Repeat the procedure every 30 seconds till the blood clots and record the time.
- Confirm the observation by checking the second tube. (One can further observe the clotted blood for clot retraction and clot lysis time)

Interpretation: Prolonged Clotting time observed: 1. Patient on heparin 2. DIC 3. Severe Hemophiliacs

24. How the respiratory tract malignancies can be detected by using sputum cytology and by using bronchoscopy material?

Ans: Respiratory tract malignancies can be detected mainly by sputum cytology or by bronchoscopy material. Sputum Cytology: Sputum specimen can be obtained from the patient either spontaneously or by aerosol-induced method. Morning specimens resulting from an overnight accumulation of secretion yield the best results. Three to five consecutive days' sputum samples should be examined to ensure maximum diagnostic accuracy. Fresh unfixed specimens are better than prefixed specimens in 70% ethyl alcohol or coating fixative such as carbowax or saccomano fixative. (Fixation of slides is discussed in a separate chapter). The sputum must be carefully inspected by pouring the specimen into a petri dish and examining it on a dark background. Select any bloody, discolored, or solid particles, if present, place a small portion of each particle on a micro slide, spread evenly, and fix it immediately. Prefixed specimens should be smeared on albumen or polylysine-coated slides.

Bronchoscopy Specimens: Specimens that are obtained by bronchoscopy are secretions (branchioalveolar lavage), direct needle aspirate from a suspicious area, and bronchial brushing and washings. Post-bronchoscopy sputum is one of the most valuable specimens for the detection of pulmonary lesions.