Class 12 Medical Diagnostics 2022 Solved Paper

SECTION-A

Answer any 03 questions out of the given 04 questions. 1 × 3 = 3

1. The ability to continue to do something, even when it is difficult, is called ____.
Ans: Perseverance.

2. Entrepreneurial behaviour requires certain knowledge, skills, or personality profile, and it is called as ____.
Ans: Entrepreneurial competency.

3. Write down the 4Rs and 1U, which are helpful to minimize waste and pollution.
Ans: 4Rs: Reduce, Reuse, Recycle, and Refuse. U-Understand.

4. Name an international organization that works prominently in the field of environmental protection.
Ans: United Nations Environment Programme (UNEP).

Answer any 01 question out of the given 02 questions. 2 × 1 = 2

5. Your mother is trying to make your home clean and germ-free. She also asks for your help. Mention four ways to make your home germ-free.
Ans: Use sustainably sourced ingredients for cleaning.
Using products that have eco-friendly packaging and avoiding plastic.
Avoid harmful chemical-based pesticides
Using biodegradable washing products.

6. Name any two common entrepreneurial competencies.
Ans: Decisiveness, initiative, interpersonal skills, perseverance, and organisational skills (any two).

SECTION-B

Answer any 05 questions out of the given 07 questions. 1 x 5 = 5

7. In a blood bank, the register is used where the Bag serial number, date of collection, date of expiry, and quantity in ml. ABO/Rh, results of testing for HIV, HBs Ag, HCV, VDRL, malarial parasite, irregular antibodies if any, name and address of the donor, utilization issue number, components prepared or discarded, sign of the medical officer are maintained. Which kind of register is this?
Ans: Master record for blood and components

8. This molecule is composed of four nitrogenous bases, a molecule of deoxyribose, and one phosphate group. Identify the molecule.
Ans: DNA.

9. While working in a laboratory, you are responsible for performing the blood grouping experiment. For one patient, you have the following result :

Anti A	Anti B	Anti D
Positive	Positive	Positive

Which blood group does the patient possess?
Ans: AB positive (AB+)

10. The system contains two antigens, JKa and JKb. The antibodies may be either IgG or IgM and may cause hemolytic disorder in newborns (HDN). Which blood group system is this?
Ans: Kidd blood group system

11. This fixative was originally recommended by Papanicolaou. It consists of equal parts of ether and 95% ethyl alcohol. It is an excellent fixative. But ether is not used in most of the laboratories because of its safety hazards, odour, and hygroscopic nature. Identify the routine fixative.
Ans: Ether alcohol mixture.

12. While performing the Hematoxylin and eosin stain in a laboratory, when you see the slide under the microscope, which part of the cell is coloured blue or black?
Ans: Nuclei.

13. In postmenopausal women, the squamo-columnar junction recedes, making it difficult to obtain a good amount of endocervical cells and cells from TZ. This problem can be solved by using a combination of two devices. What are those two devices?
Ans: Spatula plus endocervical brush.

Answer any 03 questions out of the given 05 questions. 2 × 3 = 6
14. Write down the role of different transferases enzymes in ABO blood group system.
Ans: The A gene specifies that transferase adds N-acetyl galactosamine, the B gene transferase adds N-acetyl galactose to the H gene. The H gene transferase is the L fucosyl transferase. In the AB individuals, 2 different sugars are added to different chains of the same red cells.

15. Briefly explain the antigen-antibody reaction that can occur in vitro.
Ans: The antigen-antibody reactions in vitro

- Agglutination, the clumping of particles that have an antigen on their surface and is brought about by antibodies. This forms the basis of blood grouping tests.
- Hemolysis: Rupture of red cells with release of intracellular haemoglobin can occur if the Antibody has the property of hemolysin. It requires the presence of complement.
- Precipitation, the formation of a visible insoluble complex when a soluble antibody reacts with a soluble antigen.
- Enzyme-linked immunosorbent assay (ELISA): Here, an enzyme label is used, and a colour reaction that takes place in the presence of a substrate denotes the presence of an antigen/antibody, as the case may be. This is the principle used in Transfusion-transmitted disease tests.

16. Enumerate the common sites for exfoliative cytology of body fluids.
Ans: Common sites for exfoliative cytology of body fluids

- (a) Pleural
- (b) Pericardial
- (c) Peritoneal
- (d) Synovial
- (e) Cerebrospinal

17. To diagnose cervical cancer, how can the PAP smear be advantageous?
Ans: Almost all invasive cancers of the cervix are preceded by a phase of preinvasive disease, which demonstrates microscopically a continuing spectrum of events progressing from cervical intraepithelial neoplasia (CIN) grade I to III, including carcinoma in situ, before progressing to squamous cell carcinoma. This progressive course takes about 10 to 20 years. Early detection, even at the preinvasive stage, is possible by doing a cervical smear (Pap Smear Test). This can identify patients who are likely to develop cancer, and appropriate interventions may be carried out.

18. Write a short note about special-purpose fixatives that are used for hemorrhagic samples.
Ans: 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.

Answer any 02 questions out of the given 04 questions. 3x2=6
19. Two weak subgroups A3 and Ax of the A phenotype can be differentiated by serological reactions. How can these two subgroups be determined?
Ans: The weaker subgroup of A is based on

a. The reactivity of red cells with anti-A, anti-AB, anti-H, and anti-A1.
b. The presence or absence or absence of anti-A1 in the serum and
c. The secretion of A and H substances by the secretors.

20. A mother with A blood group has given birth to a baby, who has O blood group. The father of the baby has a B blood group. How can it be possible?
Ans: The phenotypes of the A and B groups are
A: AA or AO
B: BB or BO
O: OO
The child could inherit one allele from the parents. In this scenario, the child inherited the O allele from both parents, and the blood group of the child became O.

21. After collecting the sample material from the endocervix with the help of an endocervical brush, how can the smear be prepared from the sample material?
Ans: After smear collection, the cellular sample is evenly smeared onto the centre of the non-frosted area of the glass slide, by rotating both sides of the scrape end of the spatula in multiple clockwise swirls in contact with the slide and fixing it immediately. Excessively thin or thick smears can result in false-negative reports. The smear should be visually inspected after fixation.

22. Enumerate the equipment that are needed for the FNAC procedure and write about their uses.
Ans: Equipment required

- Aspiration is done using disposable needles of 21 gauge (external diameter approximately 0.6-1.0mm) attached to a 20ml syringe.
- The FNAC needles are available in a variety of lengths. Lengths of a to 1/2 inches are found to be adequate for most palpable masses.
- The 31/2 inches 22-gauge disposable needle is used for deep-seated soft-tissue masses.
- Ultrasound or computerized tomography (CT) guidance can be utilized whenever indicated.
- Multiple aspirates should be undertaken from different areas, in case of a large tumor, to improve the yield and overcome the problem of tumor heterogeneity.

SECTION-C

(Competency-Based Questions)

Answer any 02 questions out of the given 03 questions. 4 x 2 = 8

23. The phenotype is easily detected by its failure to react with anti-H or positive reaction with all Oh groups; they are no secretors of ABH antigens, Le (a+b-), and rarely Le (a-b-). Due to the presence of anti-H, the patient cannot be transfused with any other blood except Bombay blood.

Recently, blood with weak A and weak B, in individuals with antibodies of the H antigen, is reported, and this is explained based on partial suppression and is called the Ah-Bh phenotype or para Bombay type.

(a) What are the two main Antigens of the Lewis blood group system? What are the phenotypes of the Lewis blood group system?

(b) How can the Bombay blood group and para Bombay blood group be differentiated on the basis of the secretor gene? In Lewis blood group system, which phenotypes will be secretors and which phenotypes will be non-secretors?

Ans: (a) Two main antigens are Le a, and Le b. The phenotypes are Le (a+b+), Le (a-b+), Le (a+b-), Le (a-b-)

(b) The Bombay and para-Bombay blood groups can be differentiated by the presence or absence of the H antigen in secretions.

Bombay blood group lacks H antigen on RBCs and in secretions, whereas the para-Bombay blood group lacks H antigen on RBCs but has it in secretions.

Lewis system: Secretors are either Le a+b+ or Le a-b+. Non-secretors do not have the Le b antigen

24. A lady with O- blood group has been married to a man with O+ blood group. During her first pregnancy, she delivered a baby boy who had the O+ blood group. When the lady got pregnant for the second time, the doctor advised her to go for Rh antibody titres test. How can the test be performed?

Ans: Label a row of tubes according to serum dilution 1 to 10 (1:2 to 1:5 12)

- Place 1 volume (0.1 ml) or 1 drop of saline in all tubes except the first.
- Add 1 volume (0.1ml) or 1 drop of serum to tubes 1 and 2 so that the first tube contains neat serum (1:1) and 2nd tube has 1 volume of serum in volumes of saline (1:2).
- Using a clean pipette, mix the contents of tube 2 (1: 2 dilution) without forming any bubbles and transfer one volume of the mixture to tube 3 (1:4).
- Continue the same process through all dilutions. Remove I volume from the last tube and save for use if further dilutions are required.
- Add 1 volume of 2-5% saline, and suspend appropriate red cells in each tube. (For Rh antibody titration, use ‘O’ positive pooled cells).
- Mix well and incubate at RT for 60 minutes (IgM antibodies) and centrifuge all tubes at 1000 rpm for 1 minute.
- Gently dislodge the cell button and record results using grades of agglutination reaction.
- The last tube showing a positive reaction is considered as the titre of the antibody.
- For detection of IgG antibodies: arrange a 2nd row of tubes with the same serial dilution.
- Incubate at 37 °C. Centrifuge and remove supernatant, incubate at 37 °C for 45 minutes.
- Wash with saline thrice.
- Arrange fresh tubes and add 1 drop of AHG, and add the corresponding washed cells. Incubate

- at room temperature for 5 minutes, spin at 1000 rpm for 1 minute, and look for clumping.

25. Prameela is working in a cytology laboratory in a reputed hospital. While working in a hospital laboratory, she has to maintain many rules and regulations. She is dealing with different samples, which can be non-infectious and infectious also. She is also working with flammable reagents, toxic materials, and electrical appliances. If any accident occurs in the laboratory, then she is responsible for providing first aid. What kinds of safety rules should be followed by Prameela in the hospital laboratory?

Ans: Safety In The Laboratory

- Treat all biological materials used in the laboratory as potentially infectious and pathogenic to humans.
- Laboratory coats must be worn by laboratory personnel at all times.
- All open cuts on hands and other exposed skin surfaces must be covered by gloves.
- Long hair should be tied back neatly, away from the shoulders.
- The lab should be well-ventilated and should strictly follow the regulations governing the acceptable limits of the reagents used.
- If solvents are used during practical sessions, the exhaust fan must be switched on.
- Whenever doing staining procedures, ensure that protective gowns, gloves, and safety glasses are worn.
- Inspect centrifuge tubes for cracks.
- Never pipette samples with your mouth.
- A safety data sheet should be maintained for every chemical compound used, and it should specify the nature, toxicity, and safety precautions to be taken while handling the compound.
- Proper disposal of hazardous wastes is a must.
- Every instrument used in the laboratory should meet electrical safety specifications and have written instructions regarding its use.
- Flammable materials should be stored with utmost care in appropriate storage cabinets that are designed for this purpose.
- Fire safety procedures are to be strictly adhered to. Safety equipment, including first aid kits, fire extinguishers, fire blankets, and fire alarms, should be within easy access.