

**Marking Scheme**  
**Strictly Confidential**  
**(For Internal and Restricted use only)**  
**Senior Secondary School Examination, 2026 (XII<sup>th</sup>)**  
**SUBJECT NAME : Medical Diagnostics (Q.P. CODE 828/352)**

**General Instructions: -**

<b>1</b>	The CBSE has decided to introduce On Screen Marking (OSM) for the evaluation of Class XII answer Book with the 2026 Examination.
<b>2</b>	You are aware that evaluation is the most important process in the actual and correct assessment of the candidates. A small mistake in evaluation may lead to serious problems which may affect the future of the candidates, education system and teaching profession. To avoid mistakes, it is requested that before starting evaluation, you must read and understand the spot evaluation guidelines carefully.
<b>3</b>	<b>“Evaluation policy is a confidential policy as it is related to the confidentiality of the examinations conducted, evaluation done and several other aspects. Its leakage to public in any manner could lead to derailment of the examination system and affect the life and future of millions of candidates. Sharing this policy/document to anyone, publishing in any magazine and printing in Newspaper/Website, etc. may invite action under various rules of the Board and IPC.”</b>
<b>4</b>	Evaluation is to be done as per instructions provided in the Marking Scheme. It should not be done according to one’s own interpretation or any other consideration. Marking Scheme should be strictly adhered to and religiously followed. <b>However, while evaluating, answers which are based on latest information or knowledge and/or are innovative, they may be assessed for their correctness otherwise and due marks be awarded to them. In Class-XII, while evaluating two competency-based questions, please try to understand given answer and even if reply is not from marking scheme but correct competency is enumerated by the candidate, due marks should be awarded.</b>
<b>5</b>	The Marking scheme carries only suggested value points for the answers. These are in the nature of Guidelines only and do not constitute the complete answer. The students can have their own expression and if the expression is correct, the due marks should be awarded accordingly.
<b>6</b>	The Head-Examiner must go through the first five answer books evaluated by each evaluator on the first day, to ensure that evaluation has been carried out as per the instructions given in the Marking Scheme. If there is any variation, the same should be zero after deliberation and discussion. The remaining answer books meant for evaluation shall be given only after ensuring that there is no significant variation in the marking of individual evaluators.
<b>7</b>	Evaluators will mark ( ✓ ) wherever answer is correct. For wrong answer CROSS ‘X’ be marked. Evaluators will not put right (✓) while evaluating which gives an impression that answer is correct and no marks are awarded. <b>This is most common mistake which evaluators are committing.</b>
<b>8</b>	If a question has parts, please award marks on the right-hand side for each part in the OSM Portal. Marks awarded for different parts of the question will be totaled up by the OSM System.
<b>9</b>	If a question does not have any parts, marks must be awarded in the left-hand margin in the OSM Portal. This may also be followed strictly.

10	No marks to be deducted for the cumulative effect of an error. It should be penalized only once.
11	A full scale of marks _____ (example 0 to 80/70/60/50/40/30 marks as given in Question Paper) has to be used. Please do not hesitate to award full marks if the answer deserves it.
12	Every examiner has to necessarily do evaluation work for full working hours i.e., 8 hours every day and evaluate 20 answer books per day in main subjects and 25 answer books per day in other subjects (Details are given in Spot Guidelines). This is in view of the reduced syllabus and number of questions in question paper.
13	Ensure that you do not make the following common types of errors committed by the Examiner in the past :- <ul style="list-style-type: none"> <li>• Answers marked as correct, but marks not awarded. (Ensure that the right tick mark is correctly and clearly indicated. It should merely be a line. Same is with the X for incorrect answer.)</li> <li>• Half or a part of answer marked correct and the rest as wrong, but no marks awarded.</li> </ul>
14	While evaluating the answer books if the answer is found to be totally incorrect, it should be marked as cross (X) and awarded zero (0) Marks.
15	The Examiners should acquaint themselves with the guidelines given in the <b>“Guidelines for Spot Evaluation”</b> before starting the actual evaluation.
16	The candidates are entitled to obtain photocopy of the Answer Book on request on payment of the prescribed processing fee. All Examiners/Additional Head Examiners/Head Examiners are once again reminded that they must ensure that evaluation is carried out strictly as per value points for each answer as given in the Marking Scheme.
17	<b>If a candidate attempts both alternatives/options in a question where only one option/ alternative is required to be attempted, the Evaluator shall award marks in both the options. The system will take the higher of two scores and disregard the other response.</b>
18	<b>In a question having two options/alternatives, if a candidate has attempted only one, then the evaluator shall mark “NA” (Not attempted) against the option that has not been attempted by the candidate.</b>

**MARKING SCHEME**  
**Medical Diagnostics (Subject Code- 828)**  
**(PAPER CODE: 352) (P3520828)**

Q.No.	Question	Source Material (NCERT/PSSCI VE/CBSE Study Material)	UNIT/Chapter No.	Mar ks
	<b>SECTION – A</b> <b>(Objective Type Question)</b>			
<b>1.</b>	Answer <b>any 4</b> out of the given <b>6</b> questions on Employability Skills <b>(43154 marks)</b>			
<b>(i)</b>	(A) listening		<b>U-1 Pg-3</b>	<b>1</b>
<b>(ii)</b>	(C) deadlines		<b>U-2 Pg-30</b>	<b>1</b>
<b>(iii)</b>	FFM stands for Five Factor Model of individual's personality		<b>U-2 Pg-33</b>	<b>1</b>
<b>(iv)</b>	(D) cell		<b>U-3 Pg-41</b>	<b>1</b>
<b>(v)</b>	overselves, abilities		<b>U-4 Pg-93</b>	<b>1</b>
<b>(vi)</b>	Roof top rainwater harvesting refers to the process where rainwater is collected in tanks to be used later.		<b>U-5 Pg-116</b>	<b>1</b>
<b>2.</b>	Answer <b>any 6</b> out of the given <b>7</b> questions <b>(63156 marks)</b>			
<b>(i)</b>	(A) Field's stain	CBSE Study Material	<b>Hematology Lab; 3.5 Reagents-Preparation and their uses</b>	<b>1</b>
<b>(ii)</b>	(B) hemoglobinometer	CBSE Study Material	<b>Blood Bank and Transfusion; Material and Equipment</b>	<b>1</b>
<b>(iii)</b>	(A) interpretation of exfoliative cells	CBSE Study Material	<b>Cytopathology, Introduction to Cytopathology</b>	<b>1</b>
<b>(iv)</b>	(B) Centrifuge	CBSE Study Material	<b>Hematology Lab; 3.2 Hematology Lab Instruments</b>	<b>1</b>
<b>(v)</b>	(B) squamo – columnar junction	CBSE Study Material	<b>Cytopathology, Female Genital tract</b>	<b>1</b>

(vi)	(B) 4	CBSE Study Material	<b>Blood Bank and Transfusion; Laws of Blood Smear</b>	<b>1</b>
(vii)	(A) homogeneous spread	CBSE Study Material	<b>Hematology Lab; 3.4 Preparation of Blood Smear</b>	<b>1</b>
<b>3.</b>	Answer <b>any 6</b> out of the given <b>7</b> questions ( <b>63156 marks</b> )			
(i)	(C) Le a and Le b	CBSE Study Material	<b>Blood Bank and Transfusion; Practical Importance of Other Blood Groups</b>	<b>1</b>
(ii)	(B) Pap smear test	CBSE Study Material	<b>Cytopathology, Female Genital tract</b>	<b>1</b>
(iii)	(A) Thromboplastin	CBSE Study Material	<b>Hematology Lab; 3.3 Collection of Blood samples</b>	<b>1</b>
(iv)	(D) Ig G	CBSE Study Material	<b>Blood Bank and Transfusion; Rh Antibody titers</b>	<b>1</b>
(v)	(C) Respiratory tract malignancies	CBSE Study Material	<b>Cytopathology, Respiratory Tract</b>	<b>1</b>
(vi)	(B) Basophilic	CBSE Study Material	<b>Hematology Lab; 3.6 Staining Methods</b>	<b>1</b>
(vii)	(D) May-Grunwald-Giemsa (MGG)	CBSE Study Material	<b>Cytopathology, FNAC</b>	<b>1</b>
<b>4.</b>	Answer <b>any 5</b> out of the given <b>6</b> questions ( <b>53155 marks</b> )			
(i)	(A) transparent plexiglass	CBSE Study Material	<b>Blood Bank and Transfusion; Equipment used for storage of blood</b>	<b>1</b>
(ii)	(B) Ether alcohol mixture	CBSE Study Material	<b>Cytopathology, Cytopathological Fixatives</b>	<b>1</b>

(iii)	(D) Thrombocytosis	CBSE Study Material	Hematology Lab; 3.7 measurements or Quantitative Analysis	1
(iv)	(A) Proteins	CBSE Study Material	Blood Bank and Transfusion; Basis of Immunology	1
(v)	(C) Giemsa and Distilled water	CBSE Study Material	Cytopathology; 6.6 Staining produce in Cytology	1
(vi)	(D) Complete Blood Count	CBSE Study Material	Hematology Lab; 3.1 Introduction	1
5.	Answer any <b>5 out</b> of the given <b>6</b> questions ( <b>53155 marks</b> )			
(i)	(C) i and iii	CBSE Study Material	Cytopathology, Safety in the Laboratory	1
(ii)	(D) Hematopoietic	CBSE Study Material	Hematology Lab; 3.8 Anaemia	1
(iii)	(A) ABO antigens and antibodies	CBSE Study Material	Blood Bank and Transfusion; ABO Blood Group System	1
(iv)	(C) Xylene	CBSE Study Material	Cytopathology	1
(v)	(A) Wintrobe's	CBSE Study Material	Hematology Lab; 3.7 Measurements or Quantitative Analysis	1
(vi)	(A) O+ or B+	CBSE Study Material	Blood Bank and Transfusion; ABO Blood group system	1
6.	Answer <b>any 5</b> out of the given <b>6</b> questions ( <b>53155 marks</b> )			
(i)	(C) Transfusion adverse reaction reports	CBSE Study Material	Blood Bank and Transfusion; Records in Blood Bank	1
(ii)	(C) Erythropoietin	CBSE Study Material	Hematology Lab; 3.8 Anaemia	1

(iii)	(A) Fixation	CBSE Study Material	Cytopathology 6.4 Cytological fixation	1
(iv)	(A) Clotting time	CBSE Study Material	Hematology Lab; 3.9 Hemostasis	1
(v)	(A) Fine needle aspiration cytology	CBSE Study Material	Cytopathology; 6.3 FNAC	1
(vi)	(A) Landsteiner	CBSE Study Material	Blood Bank and Transfusion; ABO Blood Group System	1
	<b>SECTION – B</b> <b>(Subjective Type Question)</b>			
	Answer any <b>3</b> out of the given <b>5</b> questions on Employability skills ( <b>3x2=6</b> marks) Answer each question in <b>20 – 30</b> words.			
<b>7.</b>	Four barriers are: - Physical barrier Psychological barrier Linguistic and Cultural barrier Personal factors Noise and Visual distractions		<b>U-1 Pg-6</b>	<b>2</b>  <b>0.5x 4</b>
<b>8.</b>	(i) Personality development is the development of an organised pattern of behaviours and attitudes that makes a person distinctive. (ii) It occurs by the ongoing interaction of temperament, character and environment.		<b>U-2 Pg-33</b>	<b>2</b> <b>(1x 2)</b>
<b>9.</b>	Electronic spreadsheets have many options to make the content look neat and easy to read. This is called formatting. Eg. (i) Aligning the text (ii) Highlighting the text		<b>U-3 Pg-54</b>	<b>2</b> <b>(1+ 1)</b>
<b>10.</b>	(i) They provide their expertise in services to create a market for technical entrepreneurs. (ii) They are not concerned with the manufacturing process but have more to do with before and after the manufacturing process.		<b>U-4 Pg-83</b>	<b>2</b> <b>(1x 2)</b>
<b>11.</b>	Green workers services include: - (i) Electricians – Who install solar panels (ii) Plumbers – Who install solar water heaters (iii) Construction workers – Who build energy-efficient green buildings (iv) Technicians and workers – Involved in establishing wind power farms and those		<b>U-5 Pg-112</b>	<b>2</b> <b>(½x 4)</b>

	working for clean and renewable energy development.			
	Answer <b>any 3</b> out of the given <b>5</b> questions ( <b>33256 marks</b> ) answer each questions in 20-30 words.			
<b>12.</b>	<p>Factors Influencing Sedimentation:</p> <p>(1) Fibrinogen, Globulin, Cholesterol: These factors increase the sedimentation rate.</p> <p>(2) RBC count – The higher the RBC count lower the ESR.</p> <p>(3) Sex: It is generally greater in women.</p> <p>(4) Pregnancy – An increased ESR is seen from the 3<sup>rd</sup> month of pregnancy and returns to normal 4 weeks after delivery.</p>	CBSE Study Material	<b>Hematology Lab; 3.7.8 Erythrocyte Sedimentation Rate</b>	<b>0.5 x 4= 2</b>
<b>13.</b>	It is used for the actual collection of blood. It can collect the desired volume of blood from the donor which is either 350 or 450 ml. It has a visible volume display and flow rate also. There is a audible alarm if the flow of blood is slow. There is a provision for automatic clamping when the volume is reached. After collection this once again gives an audible alarm.	CBSE Study Material	<b>Blood Bank and Transfusion, Equipment for blood collection</b>	<b>2</b>
<b>14.</b>	<p>(1) Adequate sample is ensured (vacuum in the tube controls the amount of blood entering the tube).</p> <p>(2) Correct ratio of anticoagulant to blood is ensured.</p> <p>(3) This is a closed system and spillage of blood and hence any Biohazard is thus avoided.</p> <p>(4) Large amounts of blood (in multiple tubes) can be collected with minimum discomfort to the patient.</p>	CBSE Study Material	<b>Hematology Lab; 3.3 Collection of blood samples</b>	<b>0.5 x 4= 2</b>
<b>15.</b>	Endo-cervical brush is a small bottlebrush-like device with one end having fine bristles made up of nylon. This device is strictly for taking materials from the endocervix. Gently insert the brush in the endocervix and rotate one turn, pressing against the upper and lower walls. The cytobrush is similar to that of an endocervical brush except that the projected tip is without bristles. This can be used for obtaining cells from the whole cervix.	CBSE Study Material	<b>Cytopathology; Female Genital Tract (FGT)</b>	<b>2</b>
<b>16.</b>	Platelet incubator –22 8C specifically designed to maintain donor platelets in an even suspension throughout the blood plasma.	CBSE Study Material	<b>Blood Bank and Transfusion, Equipment used for the storage of blood</b>	<b>1+1 =2</b>

	Platelet Agitator- It agitates at the fixed speed of 70 to 80 strokes per minute.																																							
	Answer <b>any 2</b> out of the given <b>3</b> questions ( <b>23356 marks</b> ). Answer each question in <b>30-50</b> words.																																							
17.	Nuclei: Blue/Black Cytoplasm: Pink/Blue Green Non-keratinising squamous cells: Blue/Green Keratinizing cells: Pink/Orange	CBSE Study Material	<b>Cytopathology; 6.6 Staining Procedures In Cytology</b>	<b>3</b>																																				
18.	Landsteiner discovered the ABO group antigens in 1900 and since then this is one of the most important discoveries in the field of medicine. The reciprocal relation between ABO antigens and antibodies is called Landsteiner’s law. <table border="1"><tr><th colspan="3">Cell grouping</th><th colspan="2">serum grouping</th><th>blood group</th></tr><tr><th>anti-A</th><th>anti-B</th><th>anti-AB</th><th>A cells</th><th>B cells</th><th></th></tr><tr><td>+</td><td>–</td><td>+</td><td>–</td><td>+</td><td>A</td></tr><tr><td>–</td><td>+</td><td>+</td><td>+</td><td>–</td><td>B</td></tr><tr><td>–</td><td>–</td><td>–</td><td>+</td><td>+</td><td>O</td></tr><tr><td>+</td><td>+</td><td>+</td><td>–</td><td>–</td><td>AB</td></tr></table>	Cell grouping			serum grouping		blood group	anti-A	anti-B	anti-AB	A cells	B cells		+	–	+	–	+	A	–	+	+	+	–	B	–	–	–	+	+	O	+	+	+	–	–	AB	CBSE Study Material	<b>Blood Bank and Transfusion; ABO Blood group system</b>	<b>3</b>
Cell grouping			serum grouping		blood group																																			
anti-A	anti-B	anti-AB	A cells	B cells																																				
+	–	+	–	+	A																																			
–	+	+	+	–	B																																			
–	–	–	+	+	O																																			
+	+	+	–	–	AB																																			
19.	<b>Some of the problems encountered during staining:</b> <b>Excessive blue stain</b> is seen with thick film, prolonged staining, inadequate washing and too high an alkalinity of stain or diluent. Remedial actions are using less stain or more diluents, staining for a shorter time and changing to a buffer with a low pH <b>Excessive pink stain</b> is seen with Insufficient staining, Prolonged washing, Mounting the coverslips before drying, too high an acidity of stain or buffer or methyl alcohol and the dye with improper polychromes (Try another lot) <b>Precipitate on the film</b> occurs with Dirty slides, Drying of film during the staining procedure, Improper washing of the slides, Improper Filtration of the stain and the presence of dust on the slide or smear.	CBSE Study Material	<b>Hematology Lab; 3.6 Staining Methods</b>	<b>1+1 +1= 3</b>																																				
	Answer <b>any 3</b> out of the given <b>5</b> questions ( <b>334512 marks</b> ). Answer each question in <b>50-80</b> words.																																							
20.	Coagulation system serves to convert plasma fibrinogen into solid mass of fibrin. The coagulation system is involved in haemostatic process as well as in thrombus formation. <b>Intrinsic pathway:</b> Contact with abnormal surface leads to activation of factor XII and the sequential interactions of factors XI, IX, VIII and finally factor X, along with calcium ions (factor IV) and platelet factor 3.	CBSE Study Material	<b>Hematology Lab; 3.9 Hemostasis</b>	<b>1+1 +1+ 1=4</b>																																				



	<p><b>Extrinsic pathway:</b> Damage to tissue results in the release of tissue factor or thromboplastin. The tissue factor's interaction with factor VII activates factor X.</p> <p><b>Common pathway:</b> It begins where both intrinsic and extrinsic pathways converge to activate factor X which forms a complex with factor Va and platelet factor 3, in the presence of calcium ions. This complex activates prothrombin to thrombin which then converts fibrinogen to fibrin. The monomeric fibrin so formed is polymerized to insoluble fibrin by activation of factor XIII.</p> <p>Intrinsic pathway</p> <pre> graph TD     XIIa --&gt; XIa     XIa -- APTT --&gt; IXa     VIII --&gt; VIIIa     IXa --&gt; XaVa     VIIIa --&gt; XaVa     VIIa -- PT --&gt; XaVa     TF --&gt; VIIa     Prothrombin --&gt; XaVa     XaVa --&gt; Thrombin     Thrombin --&gt; Fibrinogen     Thrombin --&gt; V     Fibrinogen -- TI --&gt; Fibrin     Fibrin --&gt; XIIIa     XIIIa --&gt; Fibrin     </pre> <p>The diagram illustrates the coagulation cascade. The intrinsic pathway starts with XIIa converting to XIa, which then activates IXa (measured by APTT). VIII converts to VIIIa, which also activates the IXa-VIIIa complex. The extrinsic pathway starts with tissue factor (TF) activating VII to VIIa (measured by PT), which then activates XaVa. Both pathways converge at XaVa, which activates prothrombin to thrombin. Thrombin converts fibrinogen to fibrin (measured by TT) and also activates V to Va. Fibrin is then polymerized by XIIIa to form a hard clot (fibrin).</p>			
21.	<p>The antigen – antibody reactions in vitro</p> <ol style="list-style-type: none"> <li>(1) Agglutination is defined as 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.</li> <li>(2) 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 a complement.</li> <li>(3) Precipitation is the formation of a visible insoluble complex when soluble antibody reacts with soluble antigen.</li> <li>(4) 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.</li> </ol>	CBSE Study Material	<b>Blood Bank and Transfusion, The antigen-antibody reactions in vitro</b>	1+1 +1+ 1=4

22.	<p>Rountine Fixatives : Freshly prepared smears can be immediately submerged in a liquid fixative. This is called wet fixation and is the ideal method for fixing all gynecological and non-gynecological smears. Any of the following alcohols can be used: (Explain Any 3).</p> <p>(1) <b>95% Ethyl Alcohol (Ethanol):</b> The ideal fixative recommended in most of the laboratories for cytological specimens is 95% ethanol alone. It produces optimal nuclear details but some amount of cell shrinkage. Absolute (100%) ethanol produces a similar effect on cells. But is much more expensive.</p> <p>(2) <b>Ether alcohol mixture:</b> 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.</p> <p>(3) <b>100% Methanol:</b> 100% methanol is an acceptable substitute for 95% ethanol. Methanol produces less shrinkage than ethanol, but it is more expensive than ethanol.</p> <p>(4) <b>80% propanol and isopropanol:</b> They cause slightly more cell shrinkage than ether ethanol or methanol. By using lower percentage of these alcohols, the shrinkage is balanced by the swelling effect of water on cells.</p> <p>(5) <b>Denatured alcohol:</b> It is ethanol that has been changed by the addition of additives in order to render it unsuitable for human consumption. It can be used at a concentration of 95% or 100%.</p>	CBSE Study Material	<b>Cytopathology; Cytological Fixatives</b>	<b>1+1 +1+ 1=4</b>
23.	<p>The magnification system is the optical component of the microscope. That magnifies the object placed on the stage. It is done by the combination of two series of lenses. The objective and the eyepiece. The objective stays near the object of the tube. The low-power objective (10x) is the smallest in size, usually with a green ring on the objective for easy identification and when the image is in focus, the low-power objective has the largest working distance (5 to 6mm).</p> <p>The working distance is the distance between the front lens and the objective side. The working distance decreases with increasing magnification and is 0.5 to 1.5mm in the case of the high power and 0.15 to 0.20mm in the case of the oil-immersion objective. The eyepiece magnifier is put on a screen. The total magnification of the object is the product of the magnifying powers of the objective and the</p>	CBSE Study Material	<b>Blood Bank and Transfusion; Equipment and regents for testing of blood</b>	<b>4</b>

	<p>eyepiece. Thus, with 10x magnification of the eyepiece, the low power objective gives 10x105100x total magnification. The high power 10x405400x magnification and for the oil-immersion lens, 10x10051000x magnification. The cost of the lens increases with higher magnification. When using oil immersion, a drop of cedar wood oil is applied directly on the smear.</p>			
<b>24.</b>	<p>General guidelines for storage and archival in a pathology laboratory: (Any 4)</p> <ol style="list-style-type: none"> <li>(1) Report duplicates / records / diagrams and Copies of any representative images prepaid should be kept for atleast 20 years.</li> <li>(2) All laboratories must retain cytology slides for a minimum of five years.</li> <li>(3) As some patients with cancer service for more than 10 years, therefore it is recommended that once the regulated length of time for storage is met, institutions may continue to store cytology slides based on the room they have for storage.</li> <li>(4) The entire archive should be professionally stored in a climate-controlled environment and its index should be available, preferable in digital format.</li> <li>(5) Paper records should be stored as bounded volumes. All documents, relevant radiographs and additional material available should be photographed and scanned to be digitally archived as well.</li> </ol>	CBSE Study Material	<b>Storage and Archiving of Specimens</b>	<b>1+1</b> <b>+1+</b> <b>1=4</b>
<b>-o O o-</b>				