

University Hospitals Bristol and Weston NHS FT
Weston Dept. Pathology
Pathology Document



University Hospitals
Bristol and Weston
NHS Foundation Trust

Department of Pathology



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Blood Sciences User Guide

Essential guidelines for staff that use
Weston General Hospital
Blood Science Services

2022 Version 2.1

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1.0 SCOPE OF DOCUMENT

This document is a User Manual which describes the services provided by the Pathology Blood Sciences laboratories at Weston General Hospital for all users and the information contained herein is correct at time of printing.

Previous versions of this manual must be destroyed on receipt of the latest version.

2.0 GENERAL INFORMATION

2.1 LABORATORY AVAILABILITY

**Routine Hours in Blood Sciences are:
09.00 - 17.30 Monday - Friday (exc. Public Holidays)**

Outside of these hours a multi-disciplinary Out of Hours (OOH) service is provided, which is staffed by a single biomedical scientist. This service is for essential urgent requests only (see section 8 below). The OOH BMS can be paged on bleep 4017.

2.2 BLOOD SCIENCES CONTACTS LIST

Blood Sciences				
Head of Service: Elizabeth Worsam	2575	01173422575	Elizabeth.Worsam@uhbw.nhs.uk	Monday - Friday
Specimen reception	5308	Switchboard		Monday - Friday
Chemical Pathology Lab:	3308	01934 647055		Monday - Friday
Chemical Pathologist:	3310	01934 647019		
Dr Wycliffe Mbagaya	3310	01934 647019	wycliffe.mbagaya@uhbw.nhs.uk	Mon / Wed / Thurs
Dr Andrew Day	3310	01934 647019	andrew.day@uhbw.nhs.uk	Tuesday
Dr Graham Bayly	3310	01934 647019	graham.bayly@uhbw.nhs.uk	Friday
Haematology Laboratory:	3307	01934 647054		Monday - Friday
Blood Transfusion Lab:	3302	01934 647052		Monday - Friday
Consultant Haematologists:				
Dr Lisa Wolger	3324			
Dr Nikesh Chavda	3323			
Dr Andrew Stewart	3324			
Dr Chith Batugedara	3323			
			Contact via: NHS e-referral – Advice and Guidance Service	Monday - Friday
Transfusion Practitioner: Ms Egle Gallo	3301 Bleep 4004	01934 647050	egle.gallo@uhbw.nhs.uk	Monday – Friday
Haematology Secretaries	3300	01934 881006		Monday - Friday

3.0 SAMPLE COLLECTION

3.1 BEFORE THE SAMPLE IS TAKEN

3.1.1 Type of sample / Sample requirements

Blood samples should always be obtained using correct technique. This will normally be using the Vacutainer system.

Note: If samples are taken by syringe and needle they **must not** be ejected into blood tubes through a hypodermic needle as this may result in haemolysis.

Adequate filling of blood tubes is essential for safe and efficient operation of laboratory services. (i.e. complete vacuum draw or up to line on tube).

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Partially filled tubes may result in an inappropriate mix of blood and preservative/anticoagulant or 'short sampling' at the analysis stage, which may cause incorrect results. Under filled tubes will be rejected for certain tests such as INR and ESR which require filling to the line.

Special handling of small samples also results in unnecessary exposure of staff to risk of blood-borne infection.

If it is not possible to provide full tubes, please adhere to the practice in the table overleaf.

3.1.2 Specific test - additional information

Patient leaflets are available from Pathology on request for the following procedures:-

- 24 hour Urine Collections
- Additional information for 24 Hour Urine collections for Catecholamines or 5HIAA
- Oral Glucose Tolerance test (GTT)
- Short Synacthen Test
- Blood Transfusion related leaflets are available (produced by NHSBT)

3.1.3 ICE requesting

Most tests that we process are now available on the ICE requesting system. Each request will generate the appropriate number of labels for the containers that we will require to perform these tests. Also this allows us to add requesting information to a test when it is chosen, to ensure that it is relevant for the patient. These include, alert messages, questions to ensure the clinical details are taken into account and suggesting other tests which may be more relevant. This information is decided by the Laboratory Consulting staff.

Inpatient requests can be added to the morning phlebotomy round and should be added before 7am. MAU, Harptree, Berrow and Steephelm can add patients to the afternoon rounds and this must be done before midday.

GP requests can be made and postponed so the labels are produced at the time of the patients appointment.

3.1.4 Request Forms

Ideally, most requests will now be made electronically through the ICE system. However, Blood Transfusion requests MUST be made manually (see section 3.1.4.1).

Where this is not the case or during downtime we will accept paper request forms, however it is important that they are filled in correctly. For guidance on the completion of request forms, including the minimum criteria for positive patient identification, please refer to the Pathology User Guide.

3.1.4.1 Blood Transfusion

ALL requests for Blood Transfusion investigations (e.g. group and screen, crossmatch, batch product requests including Human Albumin Solution, Direct Coombs testing) MUST be made on red Blood Transfusion paper request forms and include the following details:

- Forename and Surname
- Date of Birth
- Hospital or NHS number
- Signature of person who collected the sample
- Signature of Medical Officer
- Relevant clinical details
- Date and time of sample collection.

Requests for free foetal DNA testing are the ONLY exception to the above. Such requests may be made on ICE with request form printed, or NHSBT ffDNA forms.

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Blood Sample Requirements Table

	Tube required	Volume Required/ sample requirements
Chemical Pathology		
Most common tests	Yellow top tube 	At least half full (min 2.5mL)
HbA1c	Purple Top Tube 	Requires only 1mL
Glucose, Alcohol	Grey Top Tube 	Requires 2ml
Antibiotic levels	Yellow top tube 	At least half full (min 2.5mL)
Trace elements e.g. se, Zn	Dark Blue Top Tube 	Requires 6ml
Specialist Tests	See 'Sample Tubes' documents or refer to Laboratory	
Haematology/ Blood Transfusion		
Full Blood Count	Purple Top Tube 	Requires at least 1mL
Abnormal Haemoglobin	Purple Top Tube 	Requires at least 1mL
Malaria	Purple Top Tube 	Requires at least 1mL
Glandular Fever	Purple Top Tube 	Requires at least 1mL
ESR	Purple Top Tube 	At least half full (min 2.5mL)
Clotting Studies	Light Blue Top Tube 	<u>Must be filled to the line.</u> Test will not be processed if tube not full
Other tests	Yellow top tube 	At least half full (min 2.5mL)
Blood Transfusion	Pink Top Tube 	At least half full (min 2.5mL)
We may not be able to carry out all the tests requested if sample volume is insufficient.		

Notes

1. Samples should be taken directly into the Vacutainer whenever possible following the Recommended Order of Draw for Weston General Hospital (available from Pathology)
2. If using a syringe, the needle must be removed and the blood dispensed into the bottle by removing the rubber top. The top should be replaced firmly, with a final twist and taped up to indicate that the lid has been removed.
3. If sample volume is unavoidably small, please use only 1mL for FBC and send one single yellow top tube for chemistry tests.

3.2 SPECIAL REQUIREMENTS INCLUDING TIMING OF SAMPLE COLLECTION

Some tests require the sample to be taken when fasting or at a specific point in the drug regime. For information on specific tests please contact the laboratory or consult the "Sample Tubes" documents available on request from the laboratory. There are two versions of this table: one for Hospital and Pathology staff; the other for GP surgeries.

The current table is available on request and states the date of the most recent update and a version number. If in doubt please contact the relevant discipline before taking the sample.

3.3 COLLECTING THE SAMPLE

3.3.1 Sample Labelling

It is imperative that any sample taken from a patient can be positively identified. Therefore, minimum labelling requirements must be adhered to. These are documented for all Pathology specimens in the Pathology User Guide.

In addition to the requirements detailed in the Pathology User Guide, for antibiotic and therapeutic drug assays the time of sample collection should be supplied.

Please ensure that ICE labels are affixed to the specimen tube parallel to the manufacturer's label to ensure there are no delays to the test results.

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3.3.1.1 Labelling of Blood Transfusion Specimens

- All samples for blood grouping, antibody screening, antenatal investigation or cross-matching must be signed by the person taking the blood.
- Unless this minimum information (as detailed in section 3.1.4.1) is given we cannot ensure positive patient identification, and the sample may not be processed.

DO NOT USE ADDRESSOGRAPH LABELS ON BLOOD TUBES (i.e. case note labels). This practice is unsafe as it can lead to patient misidentification. Addressographs do not give enough information for blood transfusion, and cause a significant amount of errors. The samples should be written up when next to the patient.

Blood Transfusion laboratory operates a zero tolerance policy on labelling of samples. ANY errors will result in rejection of the request.

3.4 TRANSPORT TO THE LABORATORY AND SAMPLE STABILITY

For information on methods of sample transportation to the Laboratory, please refer to the Weston Pathology User Guide. It is imperative that specimens arrive in the Laboratory in a timely manner. Due to varying stabilities of the analytes measured in Blood Sciences, please be aware that some tests may not be processed if specimens are not received on the day of collection.

4.0 CHEMICAL PATHOLOGY

The Chemical Pathology department provides a comprehensive, clinically led service, with a complete repertoire of tests to support clinical care and due emphasis upon timeliness, efficiency and effectiveness. Most tests are carried out on site and other tests are referred to specialist centres. Urgent and critically abnormal test results are telephoned. All users will be able to access results using the Sunquest ICE system once the tests have been completed.

Users are welcome to telephone the laboratory to enquire about result availability if not yet available on ICE.

With due emphasis on 'added value', results interpretation and advice about further testing and investigation is always available, either from a Consultant Chemical Pathologist or a senior Biomedical Scientist. A Consultant Chemical Pathologist is available at all times (in the Department, by mobile phone or via the UHBW Duty Biochemist rota outside normal working hours) to discuss investigation, interpretation and relevant aspects of patient management.

Consultant Chemical Pathologists are also happy to review patients on the wards by request. A Consultant Chemical Pathologist also runs a Lipid Clinic and undertakes a weekly Clinical Nutrition Team ward round.

The Department supports clinical research and audit projects, and is active in training medical and scientist trainees at all levels.

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4.1 CHEMICAL PATHOLOGY INVESTIGATIONS AND TURNAROUND TIMES

<u>Routine test name</u>	<u>Non-urgent typical turnaround time</u>	<u>Routine test name</u>	<u>Non-urgent typical turnaround time</u>	<u>Non urgent or batched tests</u>
Sodium	6 hours	Triglycerides	24 hours	AST
Potassium*	6 hours	Bicarbonate	6 hours	TSH**
Chloride	6 hours	GGT	6 hours	FT4**
Urea	6 hours	LDH*	6 hours	FT3**
Creatinine	6 hours	Urate	6 hours	Direct Bilirubin
Glucose	6 hours	Iron	6 hours	IGA
ALT*	6 hours	Lithium	6 hours	IGG
ALP*	6 hours	Carbamazepine	6 hours	IGM
Total Bilirubin	6 hours	Phenytoin	6 hours	RF
Total Protein	6 hours	Theophylline	6 hours	AFP**
Albumin	6 hours	Digoxin	6 hours	CA125**
Calcium	6 hours	Gentamicin	6 hours	CEA**
Phosphate	6 hours	Vancomycin	6 hours	Oestradiol **
Magnesium	6 hours	Beta- HCG	6 hours	FSH
Amylase	6 hours	Cortisol [#]	24 hours	LH**
Lipase	6 hours	B12	24 hours	Prolactin**
Creatine Kinase	6 hours	Ferritin	24 hours	PTH**
CRP	6 hours	Folate	24 hours	Testosterone**
Cholesterol	24 hours	SARS COV2 Antibodies	24 hours	Hb A1c
Paracetamol*	6 hours	PSA	24 hours	Osmolality
Salicylate	6 hours	Vitamin D	24 hours	
Troponin T*	6 hours	Progesterone	24 hours	
HDL	24 hours	Procalcitonin	24 hours	

*These assays are highly sensitive to haemolysis

**These assays require clinical validation and will not appear on ICE until they have been reviewed by a consultant Biochemist

[#]Result will appear on ICE, Consultant Biochemist may add an additional comment based on result.

Low and high level results will take longer as they are automatically rerun for confirmation

PLEASE NOTE

1. Quoted turnaround time is defined as the time from sample receipt to result availability in ICE.
2. All samples from ED, ITU, Oncology and Seashore are treated as URGENT. Routine biochemistry requests from an urgent location, or marked as urgent, will aim to be turned around within 1 HOUR of sample receipt. From other locations please mark the as urgent on ICE and ring the laboratory if necessary.
3. The frequency of batching and the assay days can vary. Please contact the lab for more information on turnaround times of these assays.
4. Samples are kept for 7 days. Within this period additional tests may be added to those already requested. See Extra Test requesting chart for stability of samples for a particular test. Hospital staff should send an Extra Test Request form, whereas GPs may request additional tests by telephoning the laboratory.

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4.2 REFERENCE RANGES

Please refer to Appendix One.

4.3 ANTIBIOTIC LEVELS

4.3.1 Monitoring Antibiotic Levels

For guidance on Monitoring Antibiotic levels please contact the Microbiology department.

All samples submitted for assay must have the following information.

- Date and time that the level was taken
- Drug was last administered.
- Indication (i.e. diagnosis) for the antibiotic
- Dose and frequency of the prescribed antibiotic

Failure to provide this information will make it impossible to interpret the result.

4.3.2 Vancomycin

Send pre dose samples only.

Reference range: **pre dose level** 5 -10mg/L (must be < 15mg/L) **pre dose severe infection** 10-15mg/L

Take a pre-dose level before the 3rd or 4th dose (whichever is in the morning). Then administer the prescribed vancomycin dose without waiting for the result. Provided that the levels are satisfactory and that there is no deterioration in renal function, levels should then be repeated twice weekly.

4.3.3 Once daily Gentamicin

(4mg/kg with normal renal function) Reference range: pre dose level < 1mg/L

Obtain a pre-dose blood sample prior to giving the 2nd dose. This must be at least 20 hours after the 1st dose. Provided that the level is below 1mg/L and no deterioration in renal function, levels should be repeated twice weekly.

4.3.4 Multiple dosing of Gentamicin for Infective Endocarditis (IE) only

Required levels vary with organisms causing IE. Please discuss with Microbiology.

After 2 doses obtain a pre dose sample just before administration of the drug, then a post dose 1 hour after drug administration Provided levels are satisfactory and that there is no deterioration in renal function, levels should then be repeated twice weekly.

4.4 PAEDIATRIC BILIRUBIN LEVELS

4.4.1 Paediatric serum bilirubin (SBR)

Paediatric bilirubin samples must be collected in a green-top paediatric lithium heparin bottle OR a yellow-top paediatric SST bottle. All requests for paediatric bilirubin are treated as urgent. All community requests must have an accompanying telephone number for receipt of result. Paper requests are acceptable but requesting on ICE is preferred. It is important that the requestor informs the laboratory about the pending incoming of a sample prior to processing. Contact information is as above in section 2.2.

5.0 HAEMATOLOGY & BLOOD TRANSFUSION

The Haematology laboratory provides a comprehensive, high quality, general Haematology service, which involves processing and analysing the majority of tests requested on site. A Blood Group Serology & Blood Compatibility service is provided by the Transfusion laboratory.

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The Haematology & Blood Transfusion service is provided by a small team of BMSs and MLAs, under the direction of Consultant Haematologists working across the Weston Bristol sites of the University Hospitals Bristol and Weston (UHBW) Trust.

Results are reviewed by senior laboratory staff, and where appropriate, abnormal results are referred to laboratory Consultants.

The Haematology Consultants are available daily to discuss problems and review patients in addition to supporting a Clinical Haematology Out-Patient service. They are contactable by telephone at any time during the routine working week for advice. Consultant On Call Haematology advice is provided out of hours from UHBW.

5.1 REFERENCE RANGES

Please refer to Appendix Two

5.2 BLOOD TRANSFUSION LABORATORY SERVICE PROVISION

The supply of blood for transfusion by the Transfusion laboratory is subject to the following conditions.

- A full service is only available between 09.00 - 17.30, Monday to Friday.
- At all other times, including Public Holidays, compatibility testing (crossmatching) is only available for emergencies. This service is staffed by multidisciplinary personnel and by its nature restricts the repertoire of investigations available out of normal hours. Supply of blood for transfusion must be reserved for patients whose immediate management would be severely compromised without the administration of blood and or blood components during this period. (refer to Blood Transfusion Policy).
- Requests for supply of blood for normal day theatre lists should be submitted more than 24 hours in advance. For Monday lists, requests must be received the previous Friday, where appropriate.
- Requests for cross matched blood should not be arranged during the out of hours period unless urgent.
- Service constraints (i.e. staffing, blood supply and special requirements) may cause requests to be processed on the next normal working day.
- When ordering blood & components, the type (including special product requirements), quantity, date & time, and NBS indication code are required (refer to Blood Transfusion Policy).

The need for special blood requirements (e.g. irradiated, Hepatitis E neg) should be highlighted to lab staff and stored on the hospital Blood Transfusion laboratory computer. Blood Transfusion laboratory staff should check whether there are any special requirements whenever blood or blood components are requested.

Samples from patients receiving medication that may affect blood grouping and/or antibody screen results, should include details of this medication (e.g. patient on Daratumumab or Camelia). It may not be possible to process these samples on site. Therefore, specimens should be sent sufficiently in advance to allow for testing to occur at NHSBT, Filton.

5.3 CROSSMATCH / GROUP & SCREEN POLICY

If possible, requests for crossmatching should give at least 24 hours notice. If a crossmatch request for transfusion is to be made with less than 24 hours notice, please telephone the Blood Bank; as, **ONLY** telephone requests are given priority. All requests for crossmatching blood to cover Monday morning operations should be received in the laboratory on or before the preceding Friday morning. All requests for platelet transfusion should be discussed with a Clinical Haematologist.

Inappropriate requests for Group and Save will not be processed. The request form and sample will be stored until the sample is 7 days old. Further information is available in the current Trust Blood Transfusion Policy via the Trust Intranet transfusion web pages.

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Samples not meeting the fill criteria (see Blood Sample Requirements Table, page 5 of this document) may not be tested. Grossly haemolysed samples will not be tested.

Maximum Surgical Blood Order Schedule

The guidelines reflect current Trust recommendations for Weston General, which have been ratified by the Hospital Blood Transfusion Committee. When the clinical condition of the patient necessitates blood where none is indicated on the schedule, or more blood than stated to be reserved, it is imperative that the Blood Bank laboratory is contacted to discuss additional requirements. Maximum notice is essential in order to avoid delay in supply of compatible product. All requests for blood for transfusion involve compatibility testing by the Blood Transfusion laboratory. Further information is available in the current Weston Maximum Surgical Blood Order Schedule on the Trust Intranet DMS pages.

5.4 HAEMATOLOGY & BLOOD TRANSFUSION INVESTIGATIONS

Turnaround times are measured from the time of receipt to availability of report in 90% of cases		
Sample	Analysis Frequency	Working days to available result
FBC	On demand	Same day
ESR		Same day
INR, APTT		Same day
XDP		Same day
Abnormal Hb	Three batches per week	3 normal working days
Glandular Fever	Daily	Next working day
Malaria screen	On demand	A preliminary report will be issued the same normal working day
B12 & Folate	On demand	Same day
Ferritin	On demand	Same day
ANA	Samples sent to UHB for testing	14 working days
Ante-natal group	Monday - Friday	Report available by 17:30 the next working day unless abnormal results
ABO & Rh group	Monday - Friday	Report available by 17:30 the next working day
DAG/DCT(coombs)	On demand	Same working day
ffDNA	Samples sent to NHSBT for testing	14 working days

PLEASE NOTE

1. Unless stated otherwise, test results will be reported by 15:00 the next normal working day after receipt.
2. Occasionally results may be delayed awaiting comment/interpretation from the clinical Haematologist.
3. Unexpected abnormal FBC & clotting results will normally be phoned ASAP after testing.
4. The time of result availability for the above tests are subject to amendment in the event of analytical or staffing problems
5. All other tests not mentioned are generally available and may be sent to another laboratory. Please contact us for clarification of the turnaround times of these other tests.

5.4.1 Factors Affecting Tests (Haematology & Coagulation)

Blood Film: Delay in receiving sample, Sample not kept at room temperature

Citrated Platelet Count (performed for platelet clumping in EDTA): Clot in sample, underfilled sample, Platelet aggregation in citrate.

ESR - Erythrocyte Sedimentation Rate: Clot in sample, Insufficient sample, Delay in receiving sample.

Full Blood Count: Clotted sample. Insufficient sample. Lipaemic, icteric, haemolysed samples. Delayed sample receipt.

G6PD (Glucose-6-Phosphate Dehydrogenase Assay): Copper & sulphate ions decrease G6PD activity. Certain drugs interfere with circulating levels. Clotted sample.

Malaria Screen: Age of sample

Reticulocyte Count (Retic): Clotted sample. Insufficient sample. Lipaemic, icteric, haemolysed samples. Delayed sample receipt.

Zinc Protoporphyrin (ZPP): Haemolysed samples. Abnormally elevated bilirubin will create positive interference due to its spectral qualities.

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Clotting Screen (PT/APTT – Prothrombin Time, Activated Partial Thromboplastin Time) DDimer & Fibrinogen :
Anticoagulation, Delayed receipt of sample , Grossly lipaemic samples, underfilled samples.

5.5 COAGULATION – REQUESTING GUIDELINES

The Clotting screen comprises Prothrombin time (PT), APTT, a Clauss Fibrinogen assay and the PT and APTT expressed as ratios.

The indications for a clotting screen are:

1. A significant history of abnormal bleeding or bruising.
2. A significant family history of abnormal bleeding if the patient is to undergo surgery or an invasive procedure.
3. Monitoring a coagulopathy associated with massive blood transfusion.
4. Investigation of DIC.
5. Known liver disease especially prior to biopsy.
6. Pre ERCP.
7. SLE
8. Intra-uterine death.
9. GI bleed or PR bleed

The clinical details section on the laboratory request form should reflect, in summary, relevant indications supporting the clotting screen request.

Requests for clotting screens that do not fulfil the above criteria may not be processed.

The following also qualify as **inappropriate** reasons for requesting a coagulation screen:

1. Routine pre-operative unless there is a reason to suspect abnormal bleeding.
2. Monitoring anticoagulants Warfarin and Heparin (please request INR or APTR as appropriate)
3. Paracetamol overdose (please request INR only).
4. Salicylate overdose (please request INR only).

6.0 URGENT REQUESTS

Discipline	What is treated as Urgent, during working hours 09.00-17.30	What is treated as Urgent, Out of Hours 17.30-09.00 and weekends
Chemical Pathology	ED, ITU, AEC, Theatres, MAU, Seashore, Haematology Clinic, Oncology. Those marked "Urgent" or specifically discussed	All Inpatient requests
Haematology		
Blood Transfusion	Telephone Requests inc. blood groups for organ donation	All urgent crossmatch requests and major haemorrhage

6.1 EXTRA TESTS ON SAMPLES ALREADY IN THE LABORATORY

Samples are held at least **one week** in Chemical Pathology, and 2-3 days in Haematology. If you need to have results checked or to add extra tests to an existing sample please send an **"EXTRA TEST REQUEST"** form stating the sample date and time.

The following tests can be added up to the stated times				
Up to 6 hours old	Up to 12 hours old	Up to 24 hours old	Up to 48 hours old	Up to 5 days
Bicarbonate	XDP (D-Dimer)	Chloride	Amylase	AIP
Clotting Screen		FBC	Creatine Kinase (CK)	Calcium, Phosphate
ESR		Glucose	Digoxin	Cortisol

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Total Bilirubin		Potassium	Haematinics (B12, Folate, Ferritin)	Creatinine
Vancomycin		Sodium	Lactate Dehydrogenase (LDH)	Gentamicin
		Troponin T	LFTs (excluding Bilirubin)	LH, FSH, Prolactin
			Magnesium	Lipids
			Urea	Progesterone
				Testosterone
				Thyroid Function Tests
				Tumour Markers

Test requests on samples older than 5 days cannot be processed. All extra test requests must be completed on an extra test request form and sent to the laboratory. Verbal requests are not acceptable without an appropriate request form.

In Blood transfusion most tests can be performed up to a week after sample collection. Crossmatching depends on previous transfusions - see table below:

Patient Transfusion Within	Sample to be taken not more than
3 - 14 days	24hr before transfusion
15 - 28 days	72hr before transfusion
29 days to 3 months	1 week before transfusion

Patient Type	Sample Validity (from time taken to subsequent transfusion)
Patient transfused or pregnant in last 3 months	Up to 3 days (72 hrs)
Patient not transfused or pregnant in last 3 months	Up to 7 days

7.0 SAMPLES SENT TO REFERRAL LABORATORIES FOR TESTING

Tests requested that are not performed at Weston General Pathology will be referred to another laboratory for testing. Where appropriate, local hospitals are used and turnaround times are monitored.

Accreditation status of referral laboratories is checked regularly to confirm that these laboratories are working to recognised standards and are thus participating in approved EQA schemes for the tests we send them.

For more detail and addresses of our referral laboratories please see lists in the Appendices.

7.1.1 Chemistry

Most referred samples are tested at:

Bristol Royal Infirmary (UHBW-Bristol) Level 8 Upper Maudlin St Bristol BS28HW	Southmead Hospital (NBT) Westbury on Trym Bristol BS10 5NB
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7.1.2 Haematology

Most referred samples are tested at:

Bristol Royal Infirmary (UHBW-Bristol) Level 8 Upper Maudlin St Bristol BS28HW	Southmead Hospital (NBT) Westbury on Trym Bristol BS10 5NB
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7.1.3 Blood Transfusion

Most referred samples are tested at:

NHSBT North Bristol Park FILTON Bristol BS34 7QH
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8.0 OUT OF HOURS SERVICE

A Blood Sciences 24/7 service is available during the following times

- 17.30 through to 09.00 Weekdays
- Weekends
- Public Holidays

There will be some overlap of staff but for the majority of the time the BMS is working alone.

The shift BMS can be contacted if urgent on bleep 4017 or through switchboard during the above hours and supplies a multi-disciplinary service for essential urgent requests.

Results of all Out of hours investigations will be entered, on completion, onto the Pathology computer system and can be accessed on ICE, with the appropriate password, from any network PC terminal in the hospital.

8.1 CHEMICAL PATHOLOGY TESTS ROUTINELY AVAILABLE OUT OF HOURS

All automated Biochemistry and Haematology in house tests are available out of hours, with the exception of some chemistry tests such as Urine or some hormones tests, this is due to machine maintenance overnight. Any abnormal results will be phoned accordingly.

Other tests that are not routinely performed out of hours may occasionally be required urgently on clinical grounds. Such requests must be discussed with the Consultant On Call for the relevant specialty. On Call Consultants are also happy to discuss any aspect of patient investigation or results interpretation as well as to give clinical advice within their specialty area. Contact is via Switchboard.

Specimen Type	Test
Serum (SST)	See section 5.6 for a list of tests processed routinely as part of the 24/7 service
Capillary blood	Neonatal Bilirubin
Urine	Sodium
CSF	Glucose/Protein
Arterial Blood Gases	Analysers in ITU and ED are available for near-patient testing by trained users. These instruments also measure carboxyhaemoglobin and methaemoglobin.

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Other tests must be discussed with the On Call Chemical Pathologist, who is also available for clinical advice

8.2 HAEMATOLOGY TESTS ROUTINELY AVAILABLE OUT OF HOURS

Tests	
FBC	On demand
ESR	Only for the differential diagnosis of temporal arteritis
GF Screen	Dependant on differential WBC
INR, APTT, PT, DDimer, FIB	On demand
Abnormal Haemoglobin	Sickle cell screening only
Malaria Screen	Only on request received by consultant
XDP	Only for DIC ?DVT/PE
Crossmatch	If the immediate management of the patient will be adversely influenced should the transfusion of blood components not be carried out during that out of hours session
Other tests must be discussed with the On Call Consultant Haematologist, who is also available for clinical advice	

8.3 TRANSPORT OF SAMPLES OUT OF HOURS

Transport of samples to the laboratory is the responsibility of the requesting clinician. In the event of failure of the Air Tube System, contact the **hospital porters** to take urgent samples to the laboratory.

9.0 RESULTS

9.1 UHBW-WESTON

24 hour access to current and historical result data is available as part of the pathology ICE system. Users are able to access results by a terminal connected to the UHBW-Weston computer network and logging into ICE. Please do this before contacting the laboratory.

Passwords and training for result access on ICE are provided by "Clinical Systems" during routine hours and by the Radiology Department Out of Hours.

With the exception of abnormal results, results are not telephoned.

9.2 GP

Results will be sent from Pathology at regular intervals throughout the day and are imported to the practice computer at intervals decided by the practice; users will be able to access results through their own order comms system. All abnormal results for GP samples outside of routine surgery hours will be telephoned to BRISDOC out of hours service or 111.

9.3 URGENT REQUESTS

During normal working hours, abnormal Chemical Pathology and Haematology results from inpatients, ED cases and General Practitioners will usually be telephoned to the location stated on the request form. Other departments will be phoned if appropriate. It is Trust policy that results telephoned to wards be recorded electronically on Winpath and transferred to ICE.

Results for outpatients will be telephoned either to the Outpatient Department, if the requesting doctor is still likely to be in clinic, or the relevant consultant secretary

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9.4 CLINICAL ENQUIRIES

Clinical advice is available from a medical consultant during normal working hours. See Pathology Contact List. Out of Hours, advice should be sought from the on call clinician for that discipline via switchboard.

9.5 PATIENT RESULT ENQUIRY SERVICE

Results are available from the ICE system soon after they are released from the Pathology computer system (LIMS), and as printed reports for Outpatients. All users are encouraged to use this service rather than telephone the laboratory.

10.0 GOVERNANCE

The Blood Sciences laboratories at Weston General Hospital hold full accreditation with United Kingdom Accreditation Service (UKAS) for compliance with ISO 15189:2012. A comprehensive quality assurance program is an integral part of the procedures of the laboratory and is necessary for compliance with accreditation standards assessed by the UKAS.

The following examinations provided by the Blood Sciences Department do not come under our scope of accreditation to ISO 15189:-

Non-accredited tests available from Blood Sciences at Weston General Hospital

- Point of Care testing
- Chemistry tests on fluids other than blood, urine or CSF
- Haemosiderin
- Lipase
- SARS COV2 antibody testing

11.0 APPENDICES

Appendix 1	Chemistry Reference Ranges
Appendix 2	Haematology Reference Ranges
Appendix 3	Sample Tubes chart
Appendix 4	Telephone Limits Chart (Blood Sciences)
Appendix 5	Tests processed on site at Weston General Chemical Pathology

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11.1 APPENDIX ONE - CHEMISTRY REFERENCE RANGES

General Chemistry				
Test	Age	Reference Intervals		Units
		Lower	Upper	
Albumin		35	50	g/l
Albumin Children	0 – 1 year	300	45	g/l
Alkaline Phosphatase Adult		30	130	U/l
Alkaline Phosphatase Children	0-13 days	90	273	U/l
	14d- 11mths	134	518	U/l
	1yr- 9yrs	156	369	U/l
	10 – 12yrs	141	460	U/l
Alkaline Phosphatase Male	13 – 14yrs	127	517	U/l
	15-16yrs	89	365	U/l
Alkaline Phosphatase Female	13 – 14yrs	62	280	U/l
	15-19yrs	54	130	U/l
ALT (Alanine Transaminase)		10	50	U/l
Amylase		28	100	U/l
B12		180	900	pg/ml
Bicarbonate		22	29	mmol/l
Bilirubin (total)			<21	µmol/l
Bilirubin (Unconjugated)			<3.4	µmol/l
Calcium Adult		2.20	2.60	mmol/l
Calcium Children	<4 weeks	2.00	2.70	mmol/l
	1mth-16yrs	2.20	2.70	mmol/l
Chloride		93	108	mmol/l
Cholesterol (total)		Clinical decision limits		mmol/l
CK (Creatine Kinase) Male		40	320	U/l
CK (Creatine Kinase) Female		25	200	U/l
Creatinine Adult Male		59	104	µmol/l
Creatinine Adult Female		45	84	µmol/l
Creatinine Children	0-14 days	27	77	µmol/l
	15d-1y	14	34	µmol/l
	4 – 5yrs	23	37	µmol/l
	6 – 7yrs	25	42	µmol/l
	8 – 9 yrs	30	47	µmol/l
	10 – 11yrs	29	56	µmol/l
	12yrs	36	64	µmol/l
	13 yrs	36	67	µmol/l
Creatinine Male	14yrs	38	76	
	15yrs	40	83	
	16yrs	47	98	
	17yrs	54	99	
Creatinine Female	14yrs	38	74	
	15yrs	43	75	
	16yrs	44	79	
	17yrs	48	81	
CRP (C-Reactive Protein)			<6.0	mg/l
Ferritin Male		33	490	ng/ml
Ferritin Female	<44yrs	15	445	ng/ml
	> 45yrs	30	470	ng/ml
Folate		2.5	19.5	ng/ml
GGT (g-glutamyl transferase) Male		10	71	U/l
GGT (g-glutamyl transferase) Female		6	42	U/l
GGT (g-glutamyl transferase) Children	< 2wks		<165	U/l
	3wks – 3mths		<177	U/l
	3mths – 1yr		<145	U/l

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	1-15yrs		<37	U/l
Glucose (fasting)		3.0	6.0	mmol/l
HDL Cholesterol		Clinical decision limits		mmol/l
Iron		6.0	35.0	µmol/l
LDH (Lactate dehydrogenase)		0	250	U/l
LDH (Lactate dehydrogenase) Children	0 – 14days	0	1130	U/l
	15 days - 1yr	0	420	U/l
	1 – 9 yr	0	310	U/l
	10 – 14yr	0	270	U/l
Lipase		13	60	U/l
Magnesium		0.70	1.00	mmol/l
Phosphate Adult		0.80	1.50	mmol/l
Phosphate Children	<1mth	1.30	2.60	mmol/l
	1mth – 1yr	1.30	2.40	mmol/l
	1 – 16yrs	0.90	1.80	mmol/l
Potassium (k) Adult		3.5	5.3	mmol/l
Potassium (k) Children	< 4wks	3.4	6.0	mmol/l
	1mth – 1yr	3.5	5.7	mmol/l
Protein (total) serum		60	80	g/l
Protein (CSF) Adult			<0.54	g/l
Protein (CSF) Children	<30days	0.15	1.30	g/l
PSA	<59 years		<3.0	µg/l
	<69 years		<4.0	µg/l
	<79 years		<5.0	µg/l
Sodium		133	146	mmol/l
Triglycerides Adult		0.5	1.70	mmol/l
Triglycerides Children	<13wks	1.1	2.3	mmol/l
	13wks – 14yrs	0.4	1.70	mmol/l
Troponin T			<14	ng/l
Urate Male	8 – 10yrs	70	350	µmol/l
	11 – 15yrs	120	460	µmol/l
	16 yrs+	200	430	µmol/l
Urate Female	8 – 10yrs	130	370	µmol/l
	11 – 15 yrs	150	390	µmol/l
	16 – 50yrs	190	360	µmol/l
	50yrs+	140	360	µmol/l
Urate Children	<8yrs	60	240	µmol/l
Urea Adult		2.5	7.8	mmol/l
Urea Children	<28days	0.8	5.5	mmol/l
	28d – 1yr	1.0	5.5	mmol/l
	1 – 16yrs	2.5	6.5	mmol/l

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Endocrine Chemistry				
Test	Age	Reference Intervals		Units
		Lower	Upper	
Cortisol			>350	nmol/l
LH Follicular		2.4	12.6	IU/l
LH Luteal		1	11.4	IU/l
LH Male		1.6	9.6	IU/l
FSH Follicular		3.5	12.5	IU/l
FSH Luteal		1.7	7.7	IU/l
FSH Post menopausal			>30	IU/l
FSH Male		0	6	IU/l
HCG (non-pregnant)			<6	IU/l
Oestradiol Follicular		60	850	pmol/l
Oestradiol Luteal		80	1250	pmol/l
Oestradiol Post menopausal		<500		pmol/l
Oestradiol Male			<160	pmol/l
Progesterone Follicular		<4		nmol/l
Progesterone Luteal			>30	nmol/l
<i>Progesterone >30 nmol/l indicates ovulation</i>				
Prolactin Male		<700		mIU/l
Prolactin Female		<700		mIU/l
<i>Prolactin <700mIU/l unlikely of clinical significance</i>				
PTH		1.6	6.9	pmol/l
Testosterone Male		8.6	29.0	nmol/l
Testosterone Female		0.3	1.7	nmol/l
Thyroid – fT3 Adult		3.1	6.8	pmol/l
Thyroid – fT3 Children	0 – 5 days	2.6	9.6	pmol/l
	6 – 14days	3.0	9.2	pmol/l
Thyroid – fT4 Adult		12.0	22.0	pmol/l
Thyroid – fT4 Children	0 – 5 days	11.0	32.0	pmol/l
	6 – 14days	11.5	28.3	pmol/l
Thyroid – TSH Adult		0.27	4.2	mU/l
Thyroid – TSH Children	0 – 5 days	0.7	15.2	mU/l
	6 – 14days	0.72	11.0	mU/l

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Drugs						
Drug	Therapeutic Range	Units	Half Life	Sampling Time	Sample type	Time to Steady State
Carbamazepine	4.0-12.0	mg/l	12hrs	Pre-dose	SST (yellow)	2 – 6 days
Ciclosporin	100 – 225 (maintenance)	µg/l	2 – 6hrs	Pre-dose	EDTA (purple)	2 – 3 days
Digoxin	0.8 – 2.0	µg/l	36 – 48hrs	Pre-dose (or >6hrs post-dose)	SST (yellow)	5 – 7 days
Gentamicin		mg/l		Pre-dose	SST (yellow)	
Lamotrigine		mg/l	20 – 30hrs	Pre-dose	SST (yellow)	4 – 15 days
Lithium	0.4 – 1.0	mmol/l	18 – 36hrs	12 hrs post-dose	SST (yellow)	3 – 7 days
Paracetamol	See BNF for toxicity	mg/l				
Phenobarbitone		mg/l	96 hrs	Pre-dose	SST (yellow)	10 – 25 days
Phenytoin	5 - 20	mg/l	7 – 42 hrs	Pre-dose	SST (yellow)	7 – 35 days
Salicylate	See BNF for toxicity	mg/l				
Theophylline	10.0 – 20.0	mg/l	3 – 13 hrs	Oral: pre-dose IV: >2 hrs into infusion	SST (yellow)	2 – 3 days
Valproate	N/A (Toxicity at >100)	mg/l	8 – 20 hrs	Pre-dose	SST (yellow)	2 – 4 days
Vancomycin		mg/l		Pre-dose	SST (yellow)	

**Drug concentrations outside the ranges quoted may be appropriate in specific clinical circumstances. Toxic effects for some drugs may be observed at high-therapeutic levels
Pathology Consultants are available for clinical advice if required**

Tumour Markers			
Test	Clinical Decision Values		Units
	Lower	Upper	
AFP (Alpha Feto Protein)		<6	kU/l
CA125		<35	U/ml
CEA (Carcinoembryonic Antigen)		<5	µg/l

Urines			
Test	Reference Interval		Units
	Lower	Upper	
Albumin			g/l
Calcium (24hr)			mmol/24hrs
Magnesium (24hr)			mmol/24hrs
Phosphate (24hr)			mmol/24hrs
Protein (Total)			g/l
Sodium, Potassium, Urea, Creatinine			mmol/l
Urate (24hr)			mmol/24hrs

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Immunoglobulins				
Test	Age	Reference Intervals		Units
		Lower	Upper	
IgG Adult		6.0	16.0	g/L
IgG Children	<14days	5.0	17.0	g/L
	2 – 6wks	3.9	15.0	g/L
	6wks – 3mths	2.1	7.7	g/L
	3 – 6mths	2.4	8.8	g/L
	6 – 9mths	3.0	10.9	g/L
	9mths – 2yrs	3.1	13.8	g/L
	3yrs	3.7	15.8	g/L
	4-6yrs	5.4	16.1	g/L
	7-15yrs	6.0	16.0	g/L
IgM Adults	60yrs+	0.4	2.0	g/L
	18 -60yrs	0.5	2.0	g/L
IgM Children	<14 days	0.02	0.20	g/L
	2 – 6wks	0.08	0.40	g/L
	6wks – 3mths	0.15	0.70	g/L
	3 – 6mths	0.2	1.0	g/L
	6 – 9mths	0.4	1.6	g/L
	9mths – 1yr	0.6	2.1	g/L
	1-18rs	0.5	2.0	g/L
IgA Adults	45+ yrs	0.8	4.0	g/L
	18 -45yrs	0.8	2.8	g/L
IgA Children	<14 days	0.01	0.08	g/L
	2 – 6 wks	0.02	1.5	g/L
	3 – 6mths	0.15	0.7	g/L
	6 – 9mths	0.15	0.7	g/L
	9mths – 1yr	0.2	0.7	g/L
	2 - 3 yrs	0.3	1.3	g/L
	4 – 6yrs	0.4	2.0	g/L
	1 – 12yrs	0.5	2.5	g/L
	13 – 18yrs	0.8	2.8	g/L

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11.2 APPENDIX TWO - HAEMATOLOGY REFERENCE RANGES

BLOOD COUNTS* & ESR

TEST	NORMAL RANGE	UNITS
Haemoglobin	M 130 - 170 F 115 - 150	g/L
RBC	M 4.50 - 6.0 F 3.80 - 5.3	10 ¹² /L
Haematocrit [HCT]	M 0.400 - 0.520 F 1.370 - 0.470	
MCV	83 - 100	fL
MCH	27.0 - 32.0	pg
MCHC	310 - 350	g/L
WBC [total]	4.0 - 11.0	10 ⁹ /L
Neutrophils	1.5 - 8.0	10 ⁹ /L
Lymphocytes	1.0 - 4.0	10 ⁹ /L
Monocytes	0.2 - 1.0	10 ⁹ /L
Eosinophils	0.0 - 0.5	10 ⁹ /L
Basophils	0.0 - 0.2	10 ⁹ /L
Platelets	150 - 450	10 ⁹ /L
Reticulocytes	0.01 - 0.12	10 ¹² /L
ESR		
Age up to 16	1 - 10	mm/hr
Age 16 - 49	F 1 - 12 M 1 - 10	mm/hr
Age 49 - 59	F 1 - 12 M 1 - 10	mm/hr
Age 59 - 69	F 1 - 20 M 1 - 14	mm/hr
Age over 69	F 1 - 36 M 1 - 31	mm/hr

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COAGULATION

TEST	NORMAL RANGE [outside these ranges the results will be flagged red on WinPath]	UNITS
Prothrombin Time	9.5 - 12.0	secs
APTT	23.0 - 32.0	secs
Fibrinogen	1.5 - 4.0	g/L
D Dimers	Generally <500 However age related range apply which are given with the result	ng/mL
INR for patients on Warfarin	Condition dependant However generally 1.8 - 4.5	n/a
APTR for patients on heparin	1.5 - 3.5	n/a

OTHERS TESTS

Hb A2	1.5 – 3.5	%		
Hb F	Up to 0.9	%		
Ferritin	M 33 – 400	%		
	F Pre-menopausal 15 – 150	%		
	F Post-menopausal 33 - 400	%		

These reference ranges have been developed over time, sourced from BSCH guidelines, neighbouring Haematology Labs and in consultation with the relevant manufacturers and Haematology Consultants.

*Note the FBC ranges shown are based on adult ranges. Paediatrics ranges vary with age. For age correct values all appropriate ranges are assigned against patient in ICE.

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11.3 APPENDIX THREE - SAMPLE TUBES CHART

WARD VERSION
Sample Tubes Required for Pathology Blood tests (Updated September 2019)

If test is not on the list – please refer to the sending away database list

6-MMPNs & 6-TPNs	TGN	x 2 PURPLE	AKA Thiopurine Metabolites	Cholesterol	CHOL	YELLOW	
ACTH – BRI	ACTH	x 2 PURPLE	MUST ARRIVE ON ICE with 30mins of blood collection.	Chromagranin A&B - Charing Cross	CGA	2x PURPLE	To the lab ASAP
Alanine Transferase	ALT	YELLOW		Chromium –SMH	COCR	PURPLE	
Albumin	ALB	YELLOW		Cobalt – SMH	COCR	PURPLE	
Ethanol - SMH	ET	GREY	Estimated Ethanol will be supplied unless specified	Clotting Screen	CLS	BLUE	
Alkaline Phosphatase	ALP	YELLOW		Complement Studies (C3, C4) -BRI	COMP	YELLOW	
ALP Isoenzymes - BRI	UAPI	YELLOW	Clinical details needed	Copper – SMH	CU	YELLOW	
Alpha Feto Protein	AFP	YELLOW		Cortisol	CORT	YELLOW	
Alpha-1 Antitrypsin - BRI	A1T	YELLOW		C-Peptide (treat as Insulin)- Exeter	PCPT	YELLOW	Take immediately to the lab on ice
AAT Phenotype - BRI	AAP	YELLOW		C-Reactive Protein	CRP	YELLOW	
Alpha Galctosidase - BRI	FAB	PURPLE	AKA Fabrys Disease	Creatine Kinase	CK	YELLOW	
Aluminium – SMH	AL	DARK BLUE		Creatinine	CR	YELLOW	Includes eGFR (>18yrs old)
Amino Acids – BRI	BAA	GREEN	To the lab ASAP	Cryoglobulins - SMH	CRYG	YELLOW	Inform BMS. Place at 37 °C for 24hours then separate and send.
Amino Acids (Urine) BRI	UAA	URINE	To the lab ASAP	CSF Spec (Xanthochromia) –SMH	XAN	CSF	Protect from light
Amiodarone - Llandough	AMIO	PURPLE		Cyclosporin – BRI	CYC	PURPLE	Send Whole Blood
Ammonia - BRI	AMM	PURPLE	To the lab ASAP	Cytogenetics (karyotype)- SMH	CYTO	GREEN & PURPLE	NOT to be taken on Fridays AKA Genetics
Amylase	AMY	YELLOW		D-dimer, DVT, FDP, XDP	DDIM	BLUE	
Amyloid Protein – UCL	SAA	YELLOW		Dexamethasone Suppression Test	DEXA	YELLOW	1 tube taken at 9:00 AM
Androstenedione - St Thomas	AND	YELLOW		DHEAS – BRI	DHES	YELLOW	
Angiotensin Converting Enzyme- BRI	ACE	YELLOW		Digoxin	DIG	YELLOW	
ANTIBODIES (Various)		YELLOW	Contact lab for confirmation	Electrolytes	E	YELLOW	Sodium & Potassium / Creatinine
Anti- GAD - Exeter	GAD	YELLOW	Glutamic Acid Decarboxylase	Endomysial Antibodies – SMH	ENDO	YELLOW	
Antiphospholipid antibody - BRI	UACA	YELLOW	AKA Cardiolipin	Erythrocyte Sedimentation Rate	ESR	PURPLE	
Anti MUSK antibodies	MSK	YELLOW	Muscle specific kinase	Erythropoietin – SMH	EPO	YELLOW	
Apolipoprotein (Apo B)- St Thomas	APB	PURPLE		Factor VIII – BRI	F8	BLUE	Minimum of 2 bottles required
Apolipoprotein E – Cardiff	MISC	PURPLE	Send Whole blood	Factor V Leiden – BRI	F5L	BLUE	Minimum of 2 bottles required
APTT Ratio	APTR	BLUE		Ferritin	FER	YELLOW	
Aspartate Transaminase	AST	YELLOW	Haemolysis needs to be <20	FH Genotype – Great Ormond Street	FHG	x2 PURPLE	
Autoimmune Profile - BRI	UAIP	YELLOW		FK506 – SMH	FK5	PURPLE	AKA Tacrolimus
Aquaporin 4 antibodies – Oxford	AQP	YELLOW	Or CSF	Follicle Stimulating Hormone	FSH	YELLOW	
B12 and Folate	B12F	YELLOW		Free PSA- Sheffield PRU	FPSA	YELLOW	
BCR-ABL	BCR	x 4 PURPLE	AKA Philadelphia Chromosome	Free Light chains- Birm Uni	FLC	YELLOW	
Beta-2-Microglobulin - SMH	B2M	YELLOW		Free Thyroxine	FT4	YELLOW	
Beta- HCG	HCG	YELLOW	HCG, β-HCG	Free Triiodothyronine	FT3	YELLOW	
Bicarbonate (HCO ₃)	CO2	YELLOW		Fructosamine – RUH Bath	FRUC	YELLOW	
Bile Acids – BRI	TBA	YELLOW	Send same day	Full Blood Count	FBC	PURPLE	
Biotinidase – BRI	BIO	PURPLE	To the lab ASAP	Glandular Fever Screen	GF	PURPLE	AKA Paul Bunnell
Cardiolipin – BRI	UACA	YELLOW		Glucose	GLU	YELLOW/ GREY	(GTT – baseline+ 2hr)
C1-Esterase Inhibitor – SMH	C1I	YELLOW	Or Heparin sample Separate & Freeze	Growth Hormone – BRI	GH	YELLOW	

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CA 125	C125	YELLOW		G6PD – BRI	G6PD	PURPLE	
CA 15-3 – BRI	C153	YELLOW		Gamma-glutamyl transpeptidase	GGT	YELLOW	γ-GT, GGT, GGTP
CA 19-9 – BRI	C199	YELLOW		Gastrin - CCH (Inc VIP, GIP)	GAST	2 x PURPLE	Take immediately to the lab on ice
Cadmium – SMH	CD	PURPLE		Gentamicin	GENR	YELLOW	Separate yellow tube preferred
Caeruloplasmin – SMH	CAE	YELLOW		Haptoglobin – BRI	HAP	YELLOW	
Calcitonin – Charing Cross	CALT	YELL/ GREEN	To the lab ASAP	Haemoglobin A1c	A1C	PURPLE	HBA1c, A1c
Calcium	CA	YELLOW		Haemoglobin Electrophoresis	HEL	PURPLE	Includes FBC
Carbamazepine	CARB	YELLOW		HFE Gene – BRI	HGA	PURPLE	Aka Haemochromatosis
Carboxyhaemoglobin	COHB	PURPLE		HDL Cholesterol	HDL	YELLOW	
CD3/CD4 count – SMH	TSUB	PURPLE	T cell subsets	HLA Typing – NHSBT	HLA	2x PURPLE	NOT Fridays (full pink tube)
CEA	CEA	YELLOW		HLA B27 - NHSBT	B27	2x PURPLE	Add B27 to clinical details
Chloride	CL	YELLOW		Homocysteine – BRI	HCY	PURPLE	Take immediately to the lab on ice

IGF-1 - PEP	IF1	YELLOW	Insulin like Growth Factor	Protein S (part of Thromb screen)	TPR	2-4x BLUE	Minimum of 2 bottles required
IgG Subclasses - SMH	IG	YELLOW		RAST - SMH	RAST	YELLOW	Include specific allergen request
Immunoglobulin E (IgE) - SMH	IE	YELLOW	(Included in RAST)	Reticulocytes	RET	PURPLE	
Immunoglobulins (IgG, IgA, IgM)	IGS	YELLOW		Renin/Aldosterone	RAR	X2 PURPLE	Spin and Freeze immediately +
Inhibin B – Sheffield PRU	INB	YELLOW		Salicylate	SAL	YELLOW	AKA Aspirin
INR	WAR	BLUE		Selenium - NBT	SEL	YELLOW	GREEN also acceptable
Insulin - BRI	INSU	YELLOW	Take immediately to the lab on ice	Serum Protein Electrophoresis	SPE	YELLOW	
Iron	FE	YELLOW		SHBG – BRI	SHBG	YELLOW	
Islet cell antibodies - BRI	ICA	YELLOW		Short Synacthen Test	SYNW	YELLOW	(Cortisol tests) Baseline, 30min, 60min
Jak-2 Mutation - BRI	JK2	PURPLE	x 2	Sickle Cell Screen (Haemoglobin S)	HS	PURPLE	
Lactate	LACT	GREEN	Test within 20 mins on ITU ABG	T Cell Subsets (CD4/CD8) – SMH	TSUB	PURPLE	
Lactate Dehydrogenase	LDH	YELLOW		Tacrolimus (FK506) - SMH	FK5	PURPLE	
Lamotrigine-Cardiff	LAMO	PURPLE		Testosterone	TEST	YELLOW	
LDL Lipid Profile	LIP	YELLOW		Theophylline	THEO	YELLOW	
Lead - SMH	PB	PURPLE	Send Whole Blood	Thrombophilia Screen	TPR	2-4x BLUE	Minimum of 2 bottles required. Full clinical details required
Lipid screen	LIP	YELLOW		Thyroglobulin - Sheffield PRU	THYG	YELLOW	
Lipase – SMH	LPS	YELLOW	Routinely request Amylase. Confirm Lipase test with the lab	Thyroid Antibodies – SMH	TPON	YELLOW	TPO
Lipoprotein a - BIR	LPA	YELLOW					
Lipoprotein Electrophoresis - BRI	LEP	YELLOW		Thyroid Function Tests	TSH	YELLOW	TSH, TFT, Thyroid
Lithium	LI	YELLOW		Tissue Transglutaminase	UTTG	YELLOW	Coeliac Screen
Liver Function Tests	ULFT	YELLOW		Total + Direct Bilirubin	DBIL	YELLOW	
Lupus Anticoagulant - BRI	LLA	2-4x BLUE	Minimum of 2 bottles required. Full clinical details required	Total Bilirubin	TBIL	YELLOW	
Lysosomal Enzymes - SMH	WCE	2 x PURPLE	Send Whole Blood with 24 hours AKA White Cell Enzymes	Total Protein	TP	YELLOW	
Luteinising Hormone	LH	YELLOW		TPMT – Birmingham City Hosp	TPMT	2 x PURPLE	Send Whole Blood AKA azathioprine
Magnesium	MG	YELLOW		Transferrin – BRI	TBC	YELLOW	
Malarial Parasites	MP	PURPLE	Full clinical details needed (Travel)	Triglycerides	TRIG	YELLOW	
Manganese	MANG	1x PURPLE		Troponin T (Tn T, cTn T)	TROP	YELLOW	
Mast Cell Tryptase - SMH	MAS	YELLOW	AKA Tryptase	Urea	UREA	YELLOW	
Mercury – Guildford Trace	HG/UHG	PURP/ URINE	Send Whole Blood or random urine	Uric Acid (Urate)	UA	YELLOW	
Oestradiol (E2)	OEST	YELLOW		Valproate - Llandough	VAL	YELLOW	
Oligoclonal Bands - SMH	OLI	YELLOW	Take immediately to the lab	Vancomycin	VANR	YELLOW	Separate yellow tube preferred + Completed antibiotic assay form
Organic Acids – BRI	OAU	URINE	Take immediately to the lab	Very Long Chain Fatty acids - SMH	VLC	YELLOW	

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Osmolality	OSMO	YELLOW		Vitamin A + E – BRI	VIT	YELLOW	Protect from light
Paracetamol	PARA	YELLOW		Vitamin D – BRI	VITD	YELLOW	
Parathyroid Hormone	PTH	YELLOW & PURPLE	Take immediately to the lab (Yellow needed for current Ca ⁺ level)	Von Willebrand Factor - BRI	VWF	4 x BLUE	
Paroxysmal nocturnal hemoglobinuria	PNH	PURPLE	AKA PNH	White Cell Markers - BRI	MARK	PURPLE	AKA Flow Cytometry, Markers. immunophenotyping
Phenobarbitone - BRI	POB	YELLOW		Zinc – SMH	ZN	YELLOW	
Phosphate	PO4	YELLOW					
Porphyrins	Ensure all samples for porphyrin analysis are protected from light						
Plasma Porphyrins - UHW	QPB	PURPLE	Send Whole Blood				
Urine Porphyrins – UHW	QPU	URINE					
Faecal Porphyrins – UHW	QPF	FAECES					
Porphyrin screen – UHW	PORS	-	Send Whole blood, Urine and Faeces				
Plasma Viscosity - BRI	PV	PURPLE	Routinely ESR. Check with Lab				
Phenylalanine - SMH	PHAL	GREEN					
Phenytoin	PHEW	YELLOW					
Procollagen III - Manchester Liver Dept	P3NP	YELLOW	Separate Immediately & Freeze				
Progesterone	PROG	YELLOW					
Prolactin	PROL	YELLOW					
Prostate specific antigen	PSA	YELLOW					

All Microbiology samples must have a separate YELLOW (SST) and/or PURPLE (EDTA).

– Do not accept add on Microbiology requests to previous samples.

Blood Bank require PINK top (tall EDTA) samples. New samples may be required depending on patient transfusion history

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11.4 APPENDIX FOUR – BLOOD SCIENCES TELEPHONE LIMITS

Blood Sciences Telephone Limits

Test	Action Limits		Comments
	Below	Above	
Sodium	120 mmol/L	160 mmol/L	± 5 mmol respectively (Inpatient only) <130 mmol/L if <16 years old.
Potassium		6.0 mmol/L	GP patients ONLY (between 08.30 and 18.30hrs - Routine working days)
	2.5 mmol/L	6.5 mmol/L	Must be phoned on EVERY occasion
Urea		30.0 mmol/L	>10.0 if under 16 yrs old Unless within 20% of previous test
Glucose	2.5 mmol/L	25.0 mmol/L	
Creatinine AKI Score		354 μ mol/L	>200 if under 16 yrs old Unless within 20% of previous test
		2 or 3	GP patients
ALT		750 U/L	Unless previously >500 in the last 48 hours
Amylase		500 U/L	Unless elevated in last 72 hours
Calcium (adjusted)	1.90 mmol/L	3.50 mmol/L	Unless ± 0.2 mmol within last 24 hours
CK		5000 U/L	Unless >5000 U/L on this admission
Lipase		180 U/L	Unless higher in previous 72 hrs
Magnesium	0.40 mmol/L		Unless within 0.1 mmol/L in previous 24 hours
Paracetamol			Any detectable paracetamols from GP/OP ONLY
Phosphate	0.30 mmol/L		Unless within 0.1 mmol/L in previous 24 hours
Triglycerides		20 mmol/L	+ 20 mmol
Cortisol	*GP/OP:50 nmol/L 150		*Between 17:30 Fri and 09:00 Sun/BH Monday Exception: if request states dexamethasone suppression test
Troponin T CRP		14 ng/L	ONLY phone for GP patients
		300 mg/L	ONLY phone for GP patients
		200 mg/L	GP patients ONLY (between 08.30 and 18.30hrs - Routine working days)
Carbamazepine		25 mg/L	
Digoxin		2.5 μ g/L	
Gentamicin		1.0 mg/L	
Lithium		1.5 mmol/L	
Phenytoin		25 mg/L	
Theophylline		25 mg/L	
Vancomycin		30 mg/L	
Haemoglobin	75 g/L	190 g/L	Unless lower in previous 48 hrs
WBC	1.5 (10 ⁹ /L)	30.0 (10 ⁹ /L)	within 20% of previous value
Neutrophils	0.5 (10 ⁹ /L)		
Platelets	30 (10 ⁹ /L)	1000 (10 ⁹ /L)	within 20% of previous value
INR		> 5.0	
APTTR		> 5.0	

Deleted: -

Results to be phoned to Haematology Registrar or Consultant (via BRI switchboard if OOH)

New presentation of leukaemia or other haematological malignancy			
Neutrophils	<0.5 (10 ⁹ /L)		
Platelets	<20 (10 ⁹ /L)		Consider associated bleeding
Marked change in a known Haematology case			Must be considered on an individual basis

Results outside the above limits must be telephoned in accordance with Trust Clinical Governance policy "Telephone Transmission of abnormal results". Date and time of phoning and the person to whom the result is given must be recorded on LIMS. Comments in italics are the recommended repeat telephone limits. Chemistry results without recommendations must be phoned each time the limit is breached.

These limits are set as minimum guidance. Be advised that some results may still require phoning irrespective of this chart.