**EXERCISE III of III : PATIENT DILEMMA**

Your team have been given several samples that require testing to be carried out. The patient has been to health care professionals with various symptoms. The symptoms include increased hunger with weight loss, increased thirst and urination and tiredness. The healthcare team have drawn blood from the patient, which has been analysed for anemia, vitamin B12 and D deficiency and thyroid analysis; all came back clear. Further tests will be carried out on the blood; examine the blood sample tube and accompanying blood form to ensure no errors are found. A sample of blood has been given to your team to analyse the pH. A urine sample has been taken and swabbed on to an agar plate for culture analysis, including a Gram stain of the sample comparing with known bacteria. The remaining urine sample has also been given to your team to use a dipstick test for glucose analysis and to analyse the optical density (542 nm) for traces of blood in the urine.

This task requires you to communicate effectively with your entire team, each of your team needs to discuss the results and give an overall view of the test results.

**Dipstick test analysis**

Using the dipstick, ensure the indicator paper at the bottom of the strip is fully submerged in the urine. Use one of the dipstick tests in the patient urine and in the control urine. Examine the test strips after 30 seconds, comparing the patient sample with the control urine. Compare your results on the colour chart. Normal glucose levels are 0 to 0.8 mmol/ L. Levels above 0.8 mmol/ L is an indicator of a potential health problem.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Negative | Positive for glucose | | | | |
|  |  |  |  |  |  |
| 0 | 5.5 | 14 | 28 | 55 | >111 |

**Spectrophotometry analysis**

1. Turn on the spectrophotometer.
2. Press 1 on the keypad to enter single wavelength mode.
3. Enter the wavelength you wish to measure using the keypad **(be specific)**, and press Confirm.
4. You will now be on an analysis window. However first you need to tell the spectrophotometer what zero analyte looks like. To do this we will perform a blank **(A tube is labelled as BLANK)**.
5. To do this, fill a cuvette up to the tip of the arrow with blanking solution (commonly dH2O) and place it into the sample port, making sure the arrows on the cuvette match the direction of the arrows on the spectrophotometer.
6. Then press the **BLUE** zero/blank button.
7. Once confirmed the screen should read 0.000. Once complete, remove the blanking cuvette form the sample port.
8. An unknown sample can now be analysed.
9. To do this, fill a cuvette up to the tip of the arrow with sample and place it into the sample port, making sure the arrows on the cuvette match the direction of the arrows on the spectrophotometer.
10. Then press the **GREEN** confirm/go button.
11. The absorbance of your sample will now be displayed on the screen.

|  |  |  |  |
| --- | --- | --- | --- |
| **Absorbance** | **Parameters** | **Wavelength** | **Condition** |
| < 0.04 | Normal parameters | 542 | No haemoglobin detected |
| > 0.04 | Exceeds parameters | 542 | Haemoglobin present |

**pH analysis**

Blood pH is extremely important for the human body. As we have learnt previously, the blood is amazing at buffering and therefore remains at a pH between 7.35 and 7.45. When the blood pH alters above or below these parameters, health problems begin to occur. A lower pH of the blood is an indicator of diabetic ketoacidosis (DKA), whilst a higher pH is a condition called alkalosis. pH of 7.25 and 7.30 is an indicator of mild DKA. pH levels between 7 and 7.25 shows moderate DKA and the patient will be drowsy. Below pH 7 indicates severe DKA and the patient may slip into a coma.

The pH meter needs to be calibrated before use.

1. Make sure your pH meter is switched on and ensure you have at least three known pH reference buffers.
2. Press ‘CAL’ to begin the calibration. You will see a number flashing, this is the requested reference buffer.
3. Remove the probe and wash (gently) with dH2O then insert into the requested start buffer. You do not need to move the probe, simply leave it in the solution.
4. A little hourglass will flash, then disappear once the meter has calibrated. Once the hourglass stops flashing, press ‘CFM’ to confirm.
5. A second number will start flashing, this is your requested second buffer. Rinse the probe in dH2O again then insert into the second buffer.
6. Once the hourglass stops flashing, then press ‘CFM’.
7. A third buffer will be requested. Rinse the probe in dH2O again then insert into the third buffer.
8. Once the hourglass stops flashing, then press ‘CFM’.
9. A fourth buffer may also be requested by the pH meter as a flashing number (12). If you don’t have the additional requested buffer, simply press the ‘CAL’ button to end the calibration. **Make sure you press CAL before measuring unknown solutions.**
10. Now you can place your probe into the blood sample within the duran bottle.

|  |  |  |
| --- | --- | --- |
| **pH** | **Blood pH** | **Condition** |
| < 7.10 | Acidic | Ketoacidosis |
| 7.3 - 7.4 | Neutral | Healthy |
| > 7.5 | Alkaline | Alkalosis |

Questions:

What bacteria is present in the patient urine sample?

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What is the optical density of the urine sample?

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What is the pH of the blood sample?

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What is the outcome of the dipstick test? Give numerical values.

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Are any errors found for the blood sample/ form? If so, what are the errors?

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Based on the analysis of the patient samples, what diagnosis would your team give to the patient?

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