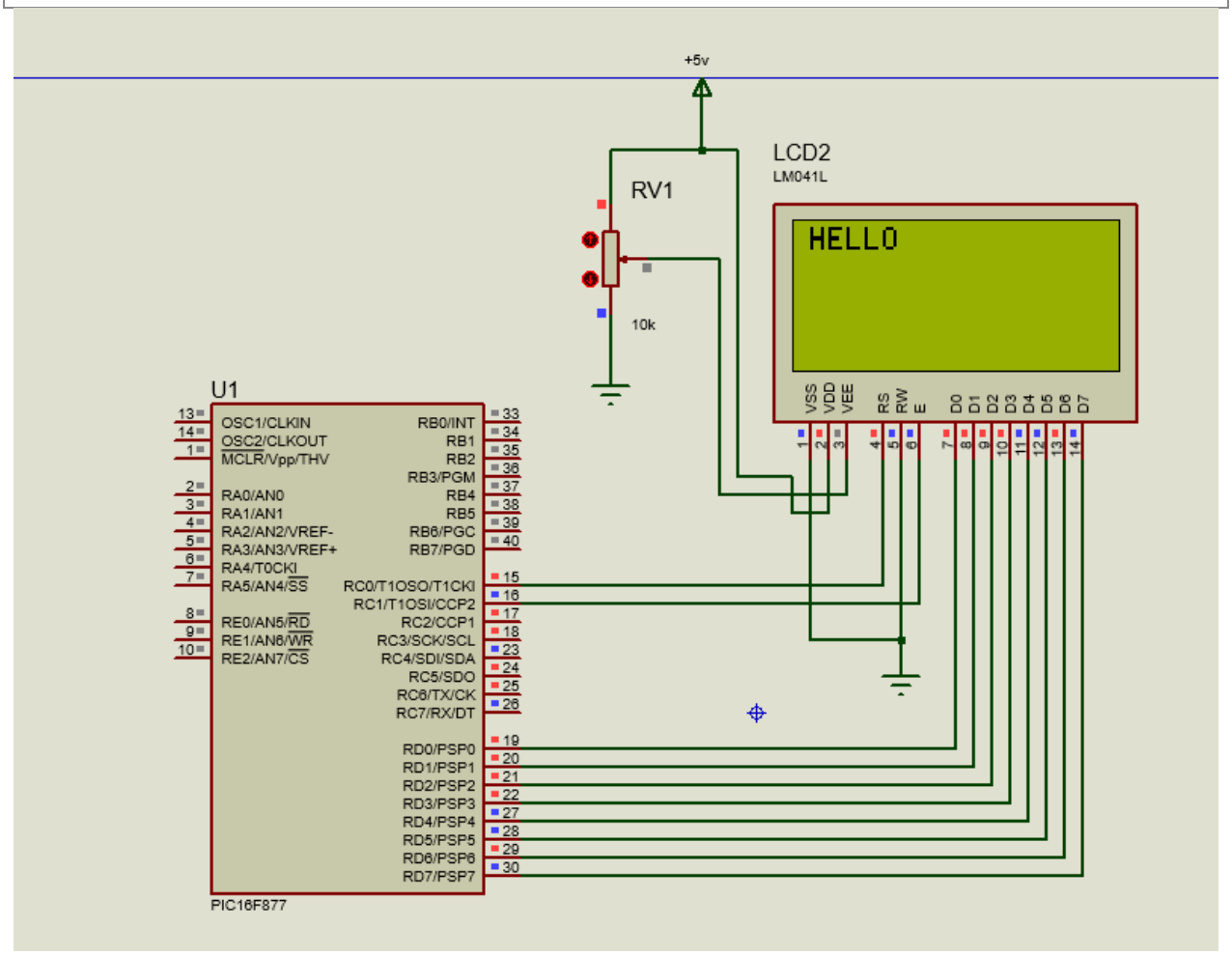
Lab 9

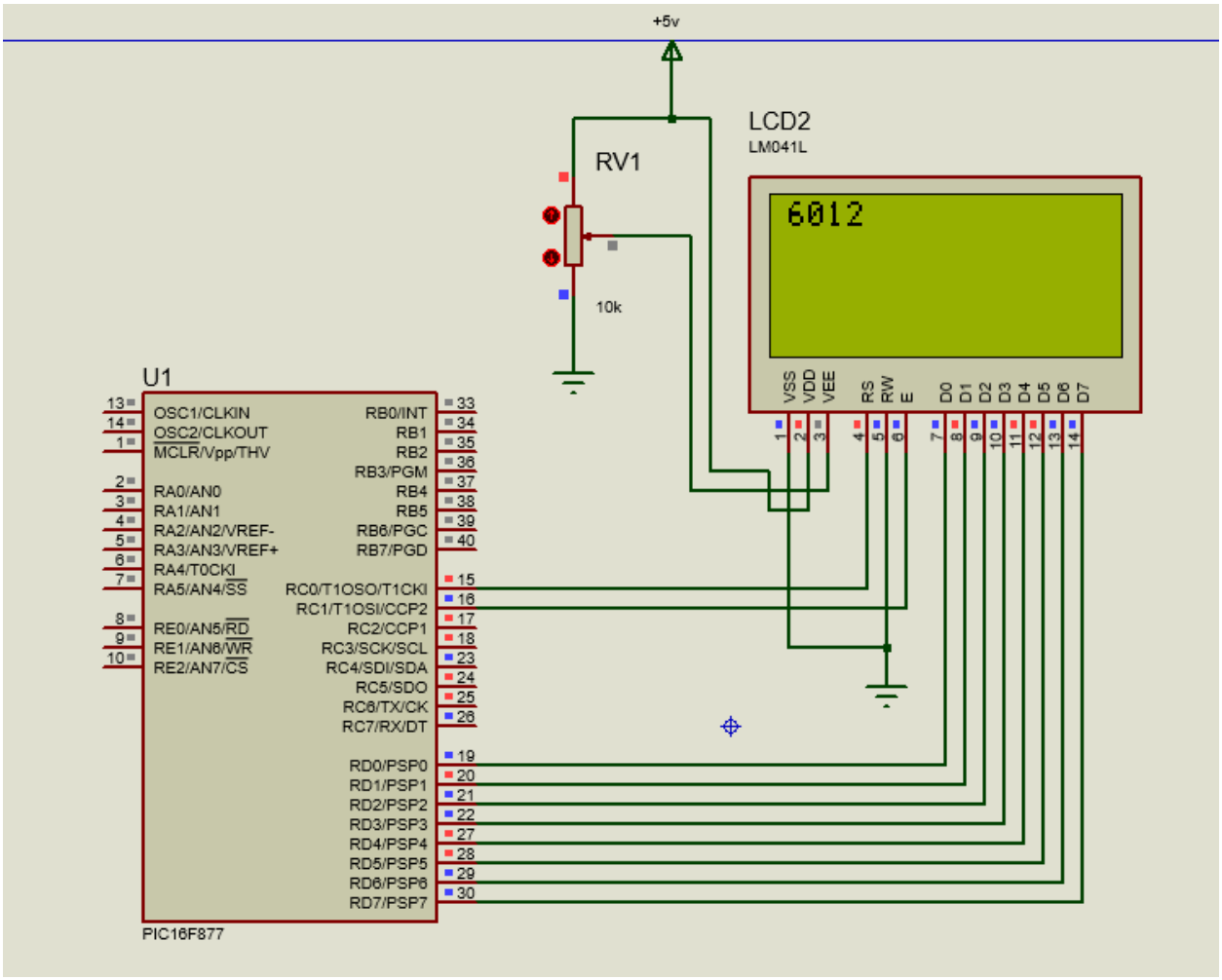
Task1

```c
#include <xc.h>
#define _XTAL_FREQ 4000000
#define RS RC0
#define EN RC1

void LCD_CMD(unsigned char);
void LCD_DATA(unsigned char);
void LCD_INIT(void);
void LCD_DELAY(void);

void main(void)
{
    TRISD = 0x00;
    TRISC = 0x00;

    LCD_INIT();
    LCD_DATA('H');
    LCD_DATA('E');
    LCD_DATA('L');
    LCD_DATA('L');
    LCD_DATA('O');



    while(1);
}
void LCD_CMD(unsigned char cmd)
{
    RS = 0;
    PORTD = cmd;
    EN = 1;
    __delay_ms(2);
    EN = 0;
    LCD_DELAY();
}
void LCD_DATA(unsigned char data)
{
    RS = 1;
    PORTD = data;
    EN = 1;
    __delay_ms(2);
    EN = 0;
    LCD_DELAY();
}
void LCD_INIT(void)
{
    LCD_CMD(0x38);
    LCD_CMD(0x0C);
    LCD_CMD(0x06);
    LCD_CMD(0x01);
    __delay_ms(2);
}
void LCD_DELAY(void)
{
    unsigned char i;
    for(i = 0; i < 250; i++);
}
```


+5v
RV1
10k
LCD2
LM041L
HELLO
VSS
VDD
VEE
RS
RW
E
D0
D1
D2
D3
D4
D5
D6
D7
U1
OSC1/CLKIN
OSC2/CLKOUT
MCLR/Vpp/THV
RA0/AN0
RA1/AN1
RA2/AN2/VREF-
RA3/AN3/VREF+
RA4/T0CKI
RA5/AN4/SS
RE0/AN5/RD
RE1/AN6/WR
RE2/AN7/CS
RB0/INT
RB1
RB2
RB3/PGM
RB4
RB5
RB6/PGC
RB7/PGD
RC0/T1OSO/T1CKI
RC1/T1OSI/CCP2
RC2/CCP1
RC3/SCK/SCL
RC4/SDI/SDA
RC5/SDO
RC6/TX/CK
RC7/RX/DT
RD0/PSP0
RD1/PSP1
RD2/PSP2
RD3/PSP3
RD4/PSP4
RD5/PSP5
RD6/PSP6
RD7/PSP7
PIC16F877

Task 2

```c
#include <xc.h>
#define _XTAL_FREQ 4000000
#define RS RC0
#define EN RC1

void LCD_CMD(unsigned char);
void LCD_DATA(unsigned char);
void LCD_INIT(void);
void LCD_DELAY(void);

void main(void)
{
    TRISD = 0x00;
    TRISC = 0x00;

    LCD_INIT();
    LCD_DATA(6+'0');
    LCD_DATA(0+'0');
    LCD_DATA(1+'0');
    LCD_DATA(2+'0');


    while(1);
}
void LCD_CMD(unsigned char cmd)
{
    RS = 0;
    PORTD = cmd;
    EN = 1;
    __delay_ms(2);
    EN = 0;
    LCD_DELAY();
}
void LCD_DATA(unsigned char data)
{
    RS = 1;
    PORTD = data;
    EN = 1;
    __delay_ms(2);
    EN = 0;
    LCD_DELAY();
}
void LCD_INIT(void)
{
    LCD_CMD(0x38);
    LCD_CMD(0x0C);
    LCD_CMD(0x06);
    LCD_CMD(0x01);
    __delay_ms(2);
}
void LCD_DELAY(void)
{
    unsigned char i;
    for(i = 0; i < 250; i++);
}
```


+5v
LCD2
LM041L
6012
RV1
10k
U1
OSC1/CLKIN
OSC2/CLKOUT
MCLR/Vpp/THV
RA0/AN0
RA1/AN1
RA2/AN2/VREF-
RA3/AN3/VREF+
RA4/T0CKI
RA5/AN4/SS
RE0/AN5/RD
RE1/AN6/WR
RE2/AN7/CS
RB0/INT
RB1
RB2
RB3/PGM
RB4
RB5
RB6/PGC
RB7/PGD
RC0/T1OSO/T1CKI
RC1/T1OSI/CCP2
RC2/CCP1
RC3/SCK/SCL
RC4/SDI/SDA
RC5/SDO
RC6/TX/CK
RC7/RX/DT
RD0/PSP0
RD1/PSP1
RD2/PSP2
RD3/PSP3
RD4/PSP4
RD5/PSP5
RD6/PSP6
RD7/PSP7
PIC16F877
VSS
VDD
VEE
RS
RW
E
D0
D1
D2
D3
D4
D5
D6
D7

Task 3

```
#include <xc.h>
#define _XTAL_FREQ 4000000

#define RS RC0
#define EN RC1

void LCD_CMD(unsigned char);
void LCD_DATA(unsigned char);
void LCD_INIT(void);
void LCD_DELAY(void);

void main(void)
{
    TRISD = 0x00;
    TRISC = 0x00;

    LCD_INIT();

    unsigned char a = 40;
    unsigned char b = 50;
    unsigned char sum, tens, units;

    sum = a + b; // sum = 90
    tens = sum / 10; // tens = 9
    units = sum % 10; // units = 0

    LCD_CMD(0xC0);

    LCD_DATA('S');
    LCD_DATA('u');
    LCD_DATA('m');
    LCD_DATA(' ');
    LCD_DATA('=');
    LCD_DATA(' ');

    LCD_DATA(tens + '0');
    LCD_DATA(units + '0');

    while(1);
}
void LCD_CMD(unsigned char cmd)
{
    RS = 0;
    PORTD = cmd;
    EN = 1;
    __delay_ms(2);
    EN = 0;
    LCD_DELAY();
}
void LCD_DATA(unsigned char data)
{
    RS = 1;
    PORTD = data;
    EN = 1;
    __delay_ms(2);
    EN = 0;
    LCD_DELAY();
}
void LCD_INIT(void)
{
    LCD_CMD(0x38);
```

```
    LCD_CMD(0x0F);
    LCD_CMD(0x06);
    LCD_CMD(0x01);
    LCD_CMD(0x1C);
    __delay_ms(2);
}
void LCD_DELAY(void)
{
    unsigned char i;
    for(i = 0; i < 250; i++);
}
```