AQA GCSE 9-1 Physics Y10 Exam Name _____
Practice Calculation Questions

Relationships to learn

P1	kinetic energy = 0.5 x mass x (speed)^2	$E_k = \frac{1}{2}\,m\,v^2$
P1	gravitational potential energy = mass x gravitational field strength (g) x height	$E_p = m\,g\,h$
P1	efficiency = useful output energy transfer / useful input energy transfer	
P1	% efficiency = 100 x useful output energy transfer / useful input energy transfer	
P1	power = energy transferred / time	$P = E / t$
P1	power = work done / time	$P = W / t$
P4	potential difference = current x resistance	$V = I\,R$
P5	power = potential difference x current	$P = V\,I$
P5	power = (current)^2 x resistance	$P = I^2\,R$
P6	density = mass / volume	$\rho = m / V$

Relationships provided in exam

P1	elastic potential energy = 0.5 x spring constant x (extension)^2	$E_e = \frac{1}{2}\,k\,e^2$
P2 P6	change in thermal energy = mass x specific heat capacity x temperature change	$\Delta E = m\,c\,\Delta\theta$
P6	For gases: pressure x volume = constant	$pV = \text{constant}$

The Earth's gravitational field strength is 9.8 N/kg

1   A 1.2 kg ball is kicked at a speed of 4 m/s. Calculate its kinetic energy.

_____ J

2   The 1.2 kg ball falls down a 3 m deep well.
    Calculate how much gravitational potential energy is loses as it falls.

_____ J

3a   Calculate the efficiency of a kettle that transfers 22 kJ of energy to the water in it
     for every 40 kJ of electrical energy supplied.

_____

3b   Give the efficiency of the kettle as a percentage.   _____

4   Calculate the energy transferred by a 24 W lamp in 45 s.

_____ J

5   Calculate the power of a motor that can do 3000 J of work in 12 s

_____ W

6   A lamp of resistance 25 ohms has a current of 3.2 A flowing through it.
       Calculate the potential difference across the lamp.

_____ V

7   A loudspeaker has a current of 1.2 A flowing through it and a potential difference of 18 V.
       Calculate the power of the speaker.

_____ W

8   A lamp of resistance 12 ohms has a current of 2 A flowing through it.
       Calculate the power of the lamp.

_____ W

9   Calculate the density of a block of metal of mass 25 kg and volume 0.02 m^3.

_____ kg/m^3

10   A spring of spring constant 25 N/m is extended by 0.2m
       Calculate the energy it stores.

_____ J

11   Water has a specific heat capacity of 4.2 J/(°C g)
       Calculate the energy needed to heat up a 250 g of water by 35 °C

_____ J

12   Calculate the pV gas constant for a sample of gas of pressure 2500 Pa and volume 15m^3

_____ Nm

Section B Questions may require converting units and/or rearranging an equation.

13   A ball travelling at a velocity of 8 m/s has 250J of kinetic energy.
      Calculate the mass of the ball.

      _____kg

14   A lamp has a current of 1.25 A when the potential difference across it is 6 V
      Calculate the resistance of the lamp.

      _____Ω

15   A 350g block of metal required 1200 J of heat energy to warm it up from 12 °C to 25°C.
      Calculate the specific heat capacity of the metal.

      _____ J/(°C g)

16   Calculate the energy stored in a spring of spring constant 120 N/m that has
      been compressed by 5cm.

      _____J

17   A motor has an efficiency of 40%. How much electrical energy needs to be supplied for the
      motor to do 240 J of work.

      _____J

18   Calculate the volume of 2kg of a liquid of density 2.2 kg/m^3

      _____ m^3

19   How much must a spring of spring constant 30 N/m be compresses to store 0.0375 J of energy.

      _____m

20   Calculate the velocity of a 1.2kg ball with a kinetic energy of 200J.

      _____m/s

Section C Questions may involve more than one step, converting units and/or rearranging an equation.

21   A spring is stretches 20cm when a force of 2.5 N is applied.
      Calculate the energy the spring will store when extended by 15cm.

      _____J

22   A weather balloon is filled with 120 m^3 of hydrogen at 100 kPa.
      Calculate the volume of the balloon at an altitude of 40 km where the pressure is 0.90 kPa

      _____m^3

23   A 2500W kettle is filled with 1250g of 20 °C water of specific heat capacity 4.2 J/(°C g)
      Calculate how long it will take to boil assuming it is 80% efficient.

      _____s

24   Calculate the speed that a 2000 W, 60% efficient motor, can lift a mass of 8.5 kg

      _____m/s

25   Calculate how long it would take a 120 kJ battery to be charged
      by a current of 1.2 A at a potential difference of 6.2 V

      _____hrs